

MATERIALS FOR A REVISION OF THE SOUTH AFRICAN SPECIES OF ENCEPHALARTOS.

By M. R. HENDERSON, F.L.S.

Two years' study of the large living collection of *Encephalartos* in the National Botanic Gardens, Kirstenbosch, has shown that the latest account of the genus, by Hutchinson and Rattray in *Flora Capensis* Vol. V, sect. ii (Suppl.) requires to be revised and supplemented. Since it was published in 1933, more material and more information has become available, especially from the Transvaal, and it is clear that Hutchinson and Rattray took too wide a view of the limits of some of the species. Their work on the nomenclature of the older species seems to be excellent, so far as it can be checked without some of the essential literature, and it has been followed closely here. Although there are a number of South African species cultivated at Kew, and although one of the authors had a wide acquaintance with the plants in the field, it seems evident that the work was done mainly on herbarium material, most of which, to judge from the South African herbaria, was far from adequate.

The late Professor C. J. Chamberlain, whose book "*The Living Cycads*" is well known, had in course of preparation when he died a monograph of the Cycadaceae. In an obituary notice in *Chronica Botanica* VII, 8, 438 (1943) an informal statement by Professor Chamberlain about the monograph is quoted. It is interesting to note his belief that nearly all Cycads hybridise. The Kirstenbosch collections show no evidence of hybridisation, but Chamberlain's statement should be kept in mind. He also hints at the variability of the species, a fact of which there is no doubt. There is also much truth in his remark that "the family has suffered terribly at the hands of the taxonomist, for it does not fit the herbarium sheet."

These plants are admittedly difficult to preserve satisfactorily and most collectors cannot spare the time necessary to make complete collections, which may mean repeated visits to a locality in order to obtain ripe cones of both sexes. Unfortunately, due to wartime restrictions and difficulties of travel, I have not been able to see the plants in the field, but the unique living collection at Kirstenbosch has compensated to a great extent for this omission and has provided opportunities for closer study than would have been possible if it had not existed. To have all the species concentrated in one small area, where all of them can be

seen every day, instead of having them spread out many days' journey apart, greatly facilitates the study of any group.

The slow growth of *Encephalartos* and the reluctance of some species to produce cones means that a study of the genus must be prolonged. No claim is made here that the material in this paper, compiled after about two years' close observation of the Kirstenbosch collections, is complete. It is manifestly far from being so. A number of species are known at present only from one or two plants, with cones of only one sex, or none, and there is yet much to learn about the variability and distribution of some of the better known species. Much field work must be done, supplemented by observation of cultivated plants, before a monographic treatment of the South African species is attempted. This paper may therefore seem premature, but circumstances demand that what has been learned should be put on record without delay, in order to demonstrate what remains to be done and in the hope that it may arouse wider interest in this ancient group of plants.

It has been said that the species of *Encephalartos* can be distinguished on pollen characters. I have examined the fresh pollen of as many species as possible but find that under a 1/6th inch objective no differences, except perhaps in size, are visible. Dr. S. Garside has very kindly examined more closely several species and he also is of the opinion that no specific characters can be obtained from the pollen. Dr. Garside states that the pollen grains vary somewhat in length in various species, and that when dry or examined in oil they are oval in outline with the ends somewhat pointed, and they have one fold or furrow. The exine is clear and colourless and without markings. The grains are clear and transmit light readily. As Dr. Garside points out, the figure given by Marloth, *Flora of South Africa*, Vol. I, Pl. 15, fig. 4, is that of a grain after contact with moisture, which has swollen and become spherical and opaque.

The fresh pollen is shed in packets, as if the contents of each microsporangium cohered in a separate mass. In this state it is slightly oily, but unless spoiled by rain, eventually becomes dry and dusty.

The various species of South African *Encephalartos* can in most cases readily be distinguished by the leaf characters of living plants, even though these characters may vary considerably even in the same individual, but herbarium material may be very misleading, especially when only parts of leaves have been preserved. The colour of the leaves and the way the leaflets are set on the rachis are often useful characters which are lost in drying. The most reliable and constant characters, however, are to be obtained from the female cone scales, especially in groups like *E. Lehmannii*, where it is very difficult to disentangle the forms on leaf characters alone. For purposes of comparison, scales

(both male and female) from the middle of the cone have been described and figured. The apical and basal scales in both sexes tend to become misshapen and abortive and there is usually a gradual, or more or less sudden, change in shape of the scales as one progresses up or down the cone.

NOTES ON COLLECTING ENCEPHALARTOS.

The collector must be prepared to suffer a little inconvenience and even pain if good specimens are to be made. The spines on the leaves of most species are so sharp and hard that they readily penetrate the skin, but they cause no ill effects beyond the drawing of a little blood and are not dangerous or irritant.

The leaf should be cut as close to the stem as possible to show the characters of the pulvinus. A cut across the top of the pulvinus and one down each side usually allows the leaf to snap off. The whole length of the leaf should be preserved, unless it is a very long one and the leaflets are uniform in shape and size over a considerable portion. If any part is discarded a note should be made of the total length of the leaf. The leaflets do not vary much on either side of the leaf at the same level, so that if the leaf is too wide for the herbarium sheet the leaflets on one side may be removed. A tag bearing the collector's number should be attached to each piece of the leaf and the tags numbered or lettered so that the leaf can be reconstructed with the pieces in their proper order. The leaves dry much faster if first dipped in poison.

I do not know of any satisfactory method of preserving ripe female cones intact—at least of those species with large cones—and in any case they are too bulky for convenience. The fully grown cone should be measured and a selection of seeds and scales taken when it disintegrates. These should be poisoned and dried in the sun, not in a press. Ripe male cones, gathered just after elongation and when pollen is being shed, will dry satisfactorily after a thorough soaking in poison, and unless roughly handled, will not fall to pieces. A selection of scales should be detached for mounting on the herbarium sheet, dried, like the female scales, in the sun and not under pressure. As the scales in both sexes vary in shape towards the apex and base of the cone, the median ones should be indicated for purposes of comparison. The male cones usually dry intact on the plant and persist for some time. In this condition they are satisfactory as specimens.

Herbarium specimens of *Encephalartos*, especially of those species with large leaves, are bulky, and if male cones are preserved entire, the collection takes up a great deal of space. This cannot be avoided if good specimens are desired.

Photographs and drawings are an essential part of the collection. Good detailed photographs of the female cones are exceedingly helpful, as are drawings of fresh scales and seeds. It is desirable also to have photographs showing the habit of the plant, demonstrating the way the leaves are held, and the shape and position of the leaflets. The latter can often best be done by photographing individual leaves detached from the plant.

Dried material has been prepared from the Kirstenbosch plants, numbered with the author's field numbers. Metal labels, bearing these numbers, have been attached to the plants from which specimens have been taken.

I am deeply indebted to Professor R. H. Compton, not only for pointing the way to a study of *Encephalartos*, but for the opportunity of acquiring a first hand knowledge of the South African flora in very pleasant surroundings. I am grateful to Dr. H. M. L. Bolus, Hon. Curator of the Bolus Herbarium, University of Cape Town, for generous permission to use the facilities of that collection and its library. I have to acknowledge with thanks the loan of valuable material from the following institutions: South African Museum, Cape Town; Albany Museum, Grahamstown; National Herbarium, Pretoria; Transvaal Museum, Pretoria; Natal Herbarium, Durban. I have received much help and information from Miss I. C. Verdoorn, National Herbarium, Pretoria, and Mr. H. B. Christian, Southern Rhodesia. Miss Courtenay-Latimer, Miss H. M. L. Forbes and Mr. G. G. Smith have very kindly supplied specimens and information. Mr. F. W. Thorns, Curator of the National Botanic Gardens, has put his knowledge of the living plants and of the Gardens Records freely at my disposal, and has lent books and photographs.

ABBREVIATIONS.

Nat. Herb.	National Herbarium, Pretoria.
Trans. Mus. Herb.	Herbarium of the Transvaal Museum, Pretoria.
Albany Mus. Herb.	Herbarium of the Albany Museum, Grahams-town.

Herb. Natal.	Natal Herbarium.
Herb. S.A. Mus.	South African Museum Herbarium, Cape Town.
Herb. Bol.	Bolus Herbarium, University of Cape Town.
Herb. N.B.G.	Herbarium of the National Botanic Gardens, Kirstenbosch.

DISTRIBUTION OF THE SPECIES.

Broadly speaking, the South African species of *Encephalartos* are found mostly in the Eastern Grasslands as defined by Pole Evans in his Vegetation Map of South Africa, with some species in the coastal forest belt, and some reaching as far as the subtropical parkland forest of Zululand. One species at least ranges from near sealevel to high up on the eastern slopes of the Drakensberg, but none crosses the escarpment westwards. Further north, however, the genus is found much further inland on the parklands and grasslands of the Transvaal. A possible seven species are known from the Transvaal, of which four are well known and distinct—*E. transvenosus*, *E. paucidentatus*, *E. lanatus*, *E. laevifolius*, all described by Stapf and Burt Davy in 1926. *E. striatus* was also described by them at the same time, but it is very imperfectly known. Two other plants have since been discovered, *E. Eugene-Maraissii*, and a plant which has been traced, with some doubt, to the neighbourhood of Zwarttruggens, W. Transvaal. The first four species at least seem to be confined to the arc of mountains running from the Zoutpansberg in the northern Transvaal to about Barberton in the eastern Transvaal, and as far as can be judged from the collections examined, above the 3,000 ft. contour. All the species are known only from the Transvaal, which, therefore, seems to have its own endemic *Encephalartos* flora. It is unlikely that this is merely a matter of insufficient exploration. Most of the Transvaal species are more or less closely related to species from outside that area. For instance, *E. Eugene-Maraissii* is the counterpart of *E. Lehmannii*, *E. transvenosus* of *E. Altensteinii*, *E. lanatus* of *E. cycadifolius*, the Zwarttruggens plant of *E. Ghellinckii* (probably), *E. striatus* of *E. villosus*. The Transvaal has apparently not produced any species related to the very distinct *E. horridus* or *E. latifrons*.

(See *E. transvenosus*, note.)

KEY TO THE SPECIES.

The following key is intended only as a rough guide to the identification of the living plant. It has had to be based mainly on foliage characters, which are variable and difficult to differentiate in a few words.

1. All leaflets, or some, or a few on each leaf, conspicuously lobed, the lobes usually cutting deeply into the body of the leaflet and often twisted out of the plane of the leaflet :
2. Leaflets broadest at apex, tapering gradually to base, apex with 3—5 almost equal lobes, cones of both sexes orange or pink, the female broadly ovoid
(7) *kosiensis*
2. Leaflets broadest near middle, or at least not tapering from apex to base, with a definite terminal lobe or point :
3. Mature plants small, with very short stems, leaves up to c. 65 cm. long, very glaucous, all leaflets except lowermost ones deeply lobed, body of leaflet curled back and lobes twisted out of plane of leaflet ; female cones small, c. 40 cm. tall, dull green with almost smooth scales and red seeds
(5) *horridus*
3. Mature plants with tall stems, or leaves much more than 65 cm. long, body of leaflet not markedly curled back, female cones where known usually over 40 cm. tall, seeds red or orange :
4. Outline of leaflets, excluding lobes, narrowly oblong, linear, or linear lanceolate, each leaf usually with some entire leaflets, at least near base :
5. Leaves not glaucous when young, up to c. 155 cm. long, apex very little recurved, lower margin of leaflet with 2—3 short broad lobes
(21) *Encephalartos* sp., *Henderson* 1591.
5. Leaves very glaucous when young, rarely more than 90—120 cm. long, apex usually markedly recurved, lower margins of leaflets rather irregularly and deeply 1—3 lobed :
6. Median and lower leaflets comparatively widely spaced, not overlapping, up to 18 cm. long, whole leaf rather lax, usually with rather few leaflets lobed and then only towards apex of leaf
(8) *Lehmannii*, form "C"
6. Median and lower leaflets shorter, usually 10—14 cm. long, more or less overlapping, whole leaf compact, most of median and upper leaflets lobed :
7. Female cone with very rugose scales, seeds reddish or orange with semitranslucent band distally, c. 5 cm. long
(8) *Lehmannii*, form "B1"
7. Female cone with corrugate scales, seeds scarlet or dark orange-red without translucent band, c. 4 cm. long
(8) *Lehmannii*, form "B2"
4. Outline of leaflets, excluding lobes, more or less ovate to ovate lanceolate or broadly oblong, most leaflets lobed :
5. Leaflets rather distant, or only slightly overlapping, dark green, lobes not or only slightly twisted out of plane of leaflet, upper margin of collar on petiolar pulvinus in an irregular inverted V
(6) *Encephalartos* sp. aff. *latifrons*, *Henderson* 2017
5. Leaflets usually crowded and overlapping, lobes more or less twisted out of plane of leaflet, upper margin of collar in a straight line across pulvinus :
6. Median leaflets up to c. 14 cm. × 7 cm., often lobed on upper margin as well as lower, leaf tips abruptly recurved, beaks of male scales long and decurved (6) *latifrons*
6. Median leaflets c. 15—16 cm. × 4—5 cm., rarely lobed on upper margins, leaflet tips not abruptly recurved, beaks of male scales short and more or less straight
(6) *Encephalartos* sp. aff. *latifrons*, *Henderson* 1680

1. Leaflets entire, or minutely toothed, or shortly and coarsely toothed, sometimes with short spine tipped or blunt lobes, but lobes not cutting deeply into body of leaflet and not twisted, lower leaflets sometimes conspicuously lobate dentate :
2. Leaflets dentate in varying degree, teeth pungent or sometimes blunt, lower leaflets occasionally lobate dentate :
3. Leaves large with very stout pulvinus, lower leaflets broad, abruptly narrowed at base, their upper margins usually deeply lobate dentate, upper leaflets more or less entire, often hooked at tips ; male cone c. 120 cm. tall, slender, bright orange yellow (13) *Woodii*
3. Leaves and cones not so :
4. Leaflets usually reduced to many prickles at bases of all leaves, petiole usually very short, or prickles extending almost to pulvinus :
5. Leaflets linear oblong, not stiff, recurved throughout length of leaf, aerial stem very short or none, female cone scales with downward overlapping, not protruding apices (3) *villosus*
5. Leaflets not linear oblong, or if so, stiff and not recurved, aerial stem usually present, often tall, female cone scales with protruding apices :
6. Leaves not more than about 130—140 cm. long, rather stiff and not eventually drooping :
7. Leaflets rather regularly 1—3 toothed on both margins, upper leaflets tending to become entire and more or less falcate, exposed face of female cone scales flat, hardly protruding, yellowish, more or less papillate . . (20) *Encephalartos* sp., "*West's Cycad*".
7. Leaflets rather regularly 3 or more toothed on both margins, upper leaflets the same and often deeply 2- or 3- dentate at apex, not falcate, female cone scales protruding, smooth, green
(22) *Encephalartos* sp., *Henderson* 2032
6. Leaves usually more than 155 cm. long, not very stiff, eventually more or less drooping :
7. Median leaflets c. 25—26 cm. long, long tapered to apex, more or less falcate, nerves conspicuous below as raised ribs
(14) *paucidentatus*
7. Median leaflets shorter, not long tapered to apex, nerves not conspicuous below (12) *transvenosus*
4. Leaflets not reduced to prickles, or only a few on some leaves, petiole usually evident :
5. All leaflets more or less linear oblong, glaucous, leaves rather short and stiff, usually not more than c. 120 cm. long :
6. Leaf rachis upcurved or incurved at apex, basal leaflets occasionally lobate dentate, apex of stem with narrow very woolly bracts.
(Transvaal) (9) *Eugene-Maraissii*.
6. Leaf rachis always more or less recurved at apex, basal leaflets entire, bracts on stem apex not narrow and woolly (E. Province, Transkei) :
7. Leaves very upright, apex rather abruptly recurved, leaflets very close and overlapping in upper part of leaf, most of them toothed (8) *Lehmannii*, form "*F*".
7. Leaves not markedly upright, leaflets not very crowded, only occasional ones toothed :
8. Lower leaflets tending to spread, female cone scales smooth, dark coloured (8) *Lehmannii*, form "*A*".
8. Lower leaflets tending to be in a V, female cone scales very rugose, greenish (8) *Lehmannii*, form "*D*".
5. Median and lower leaflets at least not linear oblong, deep green, blue green or yellow green, leaves usually eventually drooping, usually over 150 cm. long :
6. Leaves usually markedly hooked at apices, leaflets blue green, very rigid and set across rachis in a V (10) *longifolius*
6. Leaves usually only slightly recurved at apices, leaflets yellowish green to deep green, not very rigid, only upper ones in a V :

7. Leaflets rather regularly 1—3 toothed on lower margin, teeth broad and coarse, upper margin rarely toothed
(21) *Encephalartos* sp., *Henderson* 1591 etc.
7. Leaflets not so :
 8. Upper leaflets in mature leaves in a V, more or less falcate, all leaflets leaving rachis at an upwards angle, inner parts of female cone scarlet (E. Province—Natal) .. (11) *Atensteynii*
 8. Upper leaflets in mature leaves more or less recurved, not falcate, lower leaflets at least leaving rachis at 90 degrees, hidden parts of female cone pale (Transvaal) .. (12) *transvenosus*
2. Leaflets generally entire, or a few with short teeth, the sucker or juvenile leaves sometimes more or less toothed :
 3. Mature plants with subterranean stems, at most the crown above ground :
 4. Leaves usually much over 120 cm., reaching c. 270 cm. long, leaflets much more than 10 cm. long, recurved throughout length of leaf, linear oblong, reduced to many prickles at leaf base .. (3) *villosus*
 4. Leaves not exceeding c. 90 cm., usually less, leaflets rarely more than 4 cm. long, not recurved, reduced to one or two prickles, or none :
 5. Leaves less than 60 cm. long, usually spirally twisted at apex, leaflets very narrow, up to c. 11 cm. long and 0.5 cm. broad, nerves 5, visible above and below
(19) *Encephalartos* sp. aff. *Ghellinckii*, *Henderson* 1566.
 5. Leaves usually c. 90 cm. long, not spirally twisted, leaflets wider :
 6. Leaflets very crowded, arising from rachis in different planes, their bases twisted, female cone scales with large flattened not protruding apical area (E. Province) .. (1) *caffer*
 6. Leaflets not arising in different planes, not very crowded, usually more or less spaced towards base of leaf, female cone scales overlapping downwards (Zululand) (2) *Encephalartos* sp. aff. *caffer*
3. Mature plants with well developed aerial stems :
 4. Leaflets subacicular, margins strongly revolute, male cone scales stalked
(18) *Ghellinckii*
 4. Leaflets flat, male cone scales (where known), not stalked :
 5. Leaves very short, less than 60 cm. long, often spirally twisted at apex, leaflets narrow, up to c. 0.5 cm. broad
(19) *Encephalartos* sp. aff. *Ghellinckii*, *Henderson* 1566.
 5. Leaves much longer, leaflets broader :
 6. Leaves stiff and hooked at apex, blue-green, leaflets ovate to ovate-lanceolate, all in a V .. (10) *longifolius*
 6. Leaves and leaflets not so :
 7. Leaflets, at least median and upper ones, close together, not over 0.7—0.8 cm. broad, linear :
 8. Stem very stout, flat topped with much brown wool, leaves stiff and more or less straight, c. 100 cm. long, median leaflets c. 17 cm. long, margins thickened, cones of both sexes densely pale woolly (E. Province) .. (15) *cycadifolius*
 8. Stem more or less slender, not as above, leaves not stiff, eventually drooping, or apices more or less recurved, leaflets up to c. 12—13 cm. long, margins not thickened (Transvaal) :
 9. Leaf rachis more or less straight at apex, or slightly recurved or twisted, very young leaves pale brown woolly, quickly becoming glabrous, male cone scales beaked, female cone scales almost glabrous .. (17) *laevifolius*
 9. Leaf rachis usually markedly recurved at apex, the white wool of young leaves persisting for some time, male cone scales with flattened apex, female cone scales densely woolly
(16) *lanatus*
 7. Leaflets usually over 1.3 cm. broad, usually not crowded, more or less linear lanceolate :
 8. Leaf rachis upcurved or incurved at apex (Transvaal)
(9) *Eugene-Maraissii*

8. Leaf rachis always more or less recurved at apex (E. Province) :
9. Lower leaflets more or less spreading, female cone scales smooth, dark-coloured (8) *Lehmannii*, form "A"
9. Lower leaflets more or less in a V, female cone scales rugose, greenish (8) *Lehmannii*, form "D"

(1) *Encephalartos caffer* (Thunb.) Lehm., *emend.* Hutchinson & Rattray in Flora Capensis V, ii, 29 (1933), in part.

Nomenclature.—I have followed Hutchinson and Rattray because it appears that they have correctly disentangled Thunberg's *nomen confusum*, and also because it has not been possible to consult some of the older literature and specimens. The original *Cycas caffra* Thunb. was a mixture of two species, *E. longifolius* and the stemless plant now accepted as *E. caffer*. According to Hutchinson and Rattray, Thunberg's description applied partly to the stemless plant, which he also figured. The figure may be accepted as the type of *E. caffer* if no specimen exists. Lehmann, Pugillus VI, 14 (1834) merely transferred Thunberg's name to *Encephalartos*, and his short description would apply to *E. longifolius*. Thunberg's description of *E. caffer* in his Flora Capensis (ed. Schultes) also applies mainly to *E. longifolius*. I have perforce accepted Hutchinson and Rattray's reduction of *E. brachyphyllus* Lehm. to *E. caffer*, not having seen the original descriptions. But the reduction of *brachyphyllus* to a variety of *E. caffer* by De Candolle, Prod. XVI, ii, 532, and his description and the locality given for it—"Visch Rivier"—all support Hutchinson and Rattray's disposition of it. The name *E. brachyphyllus* was apparently widely accepted for the plant we now call *caffer* owing to the misapplication of the latter name to *E. longifolius* and even to *E. Altensteinii*.

In the statement regarding the late Professor Chamberlain's projected monograph of Cycadaceae, referred to in the introduction to this paper, he is quoted as follows: "*Encephalartos caffer*, the 'Caffer Bread', will still be the big plant at van Staadens, the principal species, used for food; and *Encephalartos brachyphyllus* will not become *E. caffer* but will still be the little short leaved plant in Zululand." The "*caffer*" to which Chamberlain refers is, of course, *E. longifolius*, but apparently he did not know that a "little short leaved plant" (the true *caffer*) occurs, or at least has been collected at van Staadens. Professor Chamberlain's views on nomenclature were unorthodox. The conservation of a misapplied specific name, merely because a plant has become well known under that name, can very rarely be justified, and in the case of *E. caffer* there is no reason at all why this name should be used for *E. longifolius*.

Distribution.—The most westerly record appears to be Steytlerville, the origin of some of the plants cultivated at Kirstenbosch, and the most easterly about Willowvale in the Transkei. As will appear later, the records in Flora Capensis from Zululand must be excluded.

Specimens seen.—Steytlerville, cult. in Hort. Kirstenbosch, *N.B.G.* 2601/16; van Staadens, Uitenhage Div., *Ratray* 1098 (Herb. S.A. Mus.); Mt. Coke, Kingwilliamstown, *Leighton s.n.* (Herb. Bol.); near Mt. Coke, East London, *Galpin* 7839 (Albany Mus. Herb., Nat. Herb.); East London, *Ratray s.n.* (Albany Mus. Herb.), *Wood* 846, 850 (Herb. S.A. Mus.); Columba, Kentani Distr., 1,200 ft., *Pegler* 1124 (Herb. Bol., Nat. Herb.); Kentani, 1,000 ft., *Pegler* 1116 (Herb. Bol.); Willowvale Distr., *Pegler* 844 (Herb. S.A. Mus.).

Description.—The stout stem is below ground in all specimens cultivated at Kirstenbosch, and there is a great development of short thick roots, which may be contractile (Journ. Bot. Soc. S.A., XXXIX, Pl. IV, fig. 3). *Leaves* more or less erect, variable in length, up to c. 90 cm. long, base of petiole thickly covered with pale brown woolly scales, back of rachis and edges of leaflets deciduously woolly, rachis semiterete, petiole obscurely triangular, or with an obscure ridge on upper surface; *leaflets* linear lanceolate up to c. 10 cm. long and 0.8—0.9 cm. broad, widespreading, crowded, arising from rachis in different planes, gradually reduced at base to one or two prickles, the reduced leaves sometimes forked, the others almost always entire, their bases decurrent, contracted, twisted, yellow, apices pale, pungent; nerves quite distinct below, c. 12 in median leaflets. *Male cone* solitary on a stout peduncle 13—14 cm. long, the cone green cylindric oblong, c. 27 cm. tall, 10 cm. diam.; *median scales* more or less obtriangular, c. 3.5 cm. long and 2.5 cm. wide at top, whole of the undersurface except for the narrow top covered by sporangia; top rhomboid, flat, not beaked, smooth, green, projecting beyond sporangial surface for 5—6 mm., apex with a very slightly depressed area c. 1 cm. $\times$ 1.5 cm., bordered by a thin, slightly raised, sometimes more or less toothed rim, the teeth more evident on upper scales. *Female cone* solitary, broadly oblong lanceolate, apex rounded, c. 28—30 cm. tall, 14 cm. diam. near base, general colour when ripe greenish yellow, peduncle almost hidden by erect densely woolly bracts, c. 6—7 cm. long, c. 3.5 cm. diam. near apex, yellow below, green above, glabrous; 6—8 spirals of scales; scales glabrous, apices almost flat, projecting very little beyond surface of cone; *median scales* c. 5.5 cm. total length, c. 5.5 cm. greatest breadth, exposed face irregularly rhomboid to elliptic, c. 5.5 cm. across and 3.5 cm. vertically, but variable in size, upper angle rounded, lower angle rounded, humped and projecting c. 0.7—1 cm. beyond surface

of cone, lateral angles usually more or less rounded with often a narrow sharp ridge; exposed face more or less shining except in centre, more or less corrugate, pitted round margin, centre occupied by a flat dull green pitted area which is roughly hexagonal and surrounded by a

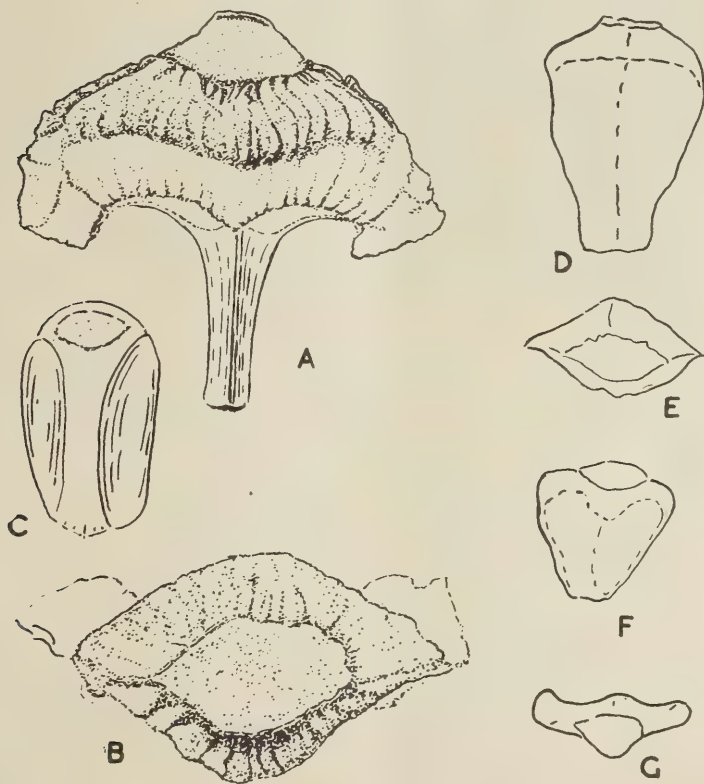


Fig. 1. A, B—*E. caffer*, median female scales from above and from front, C—seed. D, E—*E. caffer*, median male scales from below and from front. F, G—median male scales of plant from ?Lourenço Marques, from below and from front. About nat. size. Del: M. P. Henderson.

narrow slightly raised rim, its lower margin projecting and sometimes slightly irregularly toothed, c. 3 cm. across and 1.5 cm. vertically, increasing in size towards base of cone; inner part of scale pale orange yellow or orange, closely papillate, stipe c. 3 cm. long tinged pink to

scarlet; sinus arms up to c. $\frac{1}{3}$ length of seed, outer margins more or less winged; seeds more or less oblong, deep scarlet, compressed and tapered to wedgeshaped distal end, up to c. 3.8 cm. long and 2.3 cm. diam., occasional seeds pale pinkish yellow.

(2) *Encephalartos* sp., aff. *caffer* Lehm.

Nomenclature.—This plant is included under *E. caffer* Lehm. by Hutchinson and Rattray, but it differs in several significant points and must be considered distinct. It is apparently undescribed. It might be Aiton's "Trifid narrow-leaved *Zamia*"—*Zamia Cycadis* L., β , Hort. Kew., V, 412 (1813). It is unlikely that *E. brachyphyllus* Lehm. is applicable to this plant as the evidence goes to show that this name is an exact synonym of *E. caffer* Lehm.

Distribution.—*E. caffer* Lehm., as far as is known, does not extend into Natal, although the distribution given in *Flora Capensis* would seem to imply that it occurred continuously from the Eastern Cape Province through Natal into Zululand. There is a distinct gap between *E. caffer* and our unnamed plant, which is said to be common in Zululand.

Specimens seen.—Near Ngoye, Zululand, *Rattray* 1279 (Albany Mus. Herb.); Mkuzi, in crevices of diabase rocks on sides and top of Lebombo Mts., Zululand, 1,000—2,000 ft., *Galpin s.n.* (Herb. Bol., Nat. Herb.); Ubombo Mts., Zululand, *Gerstner s.n.* (Herb. Natal.), *Galpin* 11818 (Nat. Herb.); Ingwavuma, Zululand, *Conyngham* 1a, 1b, 1c (Nat. Herb.); cult. in Botanic Gardens, Durban, origin Zululand, *Herb. Natal.* 16040, 16041, 16048 (Herb. Natal.); living plants from Ubombo Mts., Zululand, *comm. Butcher*, cult. in Kirstenbosch, *N.B.G.* 255/44.

Description.—The stem is apparently subterranean as in *E. caffer* (but Galpin records it as 12—18 inches tall) and the roots large and swollen as in that species. *Leaves* differing from those of *caffer* in the leaflets being more dentate in the juvenile stage, in adult leaves the leaflets very regularly inserted on the rachis, slightly spaced, or at least not crowded, with much less tendency to arise in different planes, not twisted at base and less narrowed, the pubescence rather coarser and browner and more persistent.

No male cones have been seen, and of the female cones only photographs taken in Durban have been available. These photographs depict the complete plant and there is sufficient detail in the leaves to be certain that the plant is the one under discussion here. The cones are solitary, apparently almost sessile, oblong-ellipsoid, probably about 30 cm. tall, with about 8 spirals of scales. The scale apices are flattened and overlap downwards, and do not have the protruding lower angle and the central flattened and somewhat depressed area of *E. caffer*. The cone is very

similar to that of *E. villosus* (Plate II), except that the lower margins of the scales are nearly entire.

Encephalartos sp., aff. ***E. caffer*** Lehm., vel aff. ***E. villosus*** Lem.

Specimens seen.—Portuguese E. Africa, cult. in W.N.L.S. compound, Ressano Garcia, *Moss s.n.* (Nat. Herb.); Namaacha, Portuguese E. Africa, cult. at Pretoria, *Mogg s.n.* (Nat. Herb.); Delagoa Bay, *Marloth 11044* (Nat. Herb.); Cult. at Barberton, origin uncertain but perhaps Lourenco Marques, *Thorncroft s.n.* (Herb. N.B.G.); ? native compound, Komatipoort, Transvaal, *Moss s.n.* (Nat. Herb.).

The above specimens represent a group which is close to the species here referred to as *E. sp. aff. caffer* from Zululand, but the general appearance of the specimens suggests a relationship also with *E. villosus*.

The young *leaves* are white woolly on the rachis, not brown woolly as in the Zululand plant, and apparently quickly become glabrous; the leaflets are longer, more coriaceous, and resemble those of *villosus* in being often tridentate at the apex. A ripe *male cone* from a cultivated plant whose origin may have been Lourenco Marques was sent by Mr. J. Thorncroft. The cone had elongated and was nearly dry. Total length, excluding peduncle, 20 cm., greatest diam. c. 4.5 cm.; peduncle c. 5 cm. long (if complete), nearly glabrous with a few small scattered bracts; cone narrowly oblong lanceolate, tapering gently from near base to apex; *median scales* broadly obtriangular, c. 2—2.2 cm. long, 1.9—2 cm. across widest part, lateral angles acute, almost winged, upper angle slightly raised into a blunt triangular point, lower angle produced into a broad rounded triangular point; the flattened apex with a roughly rhomboid sunken area; sporangia not covering lower surface of scale to margin. This cone differs from that of *E. caffer* in being more slender and more tapered, and in having smaller scales with narrower apices without a well defined flattened area. It is reminiscent of the cone of *E. villosus* but much smaller. No female cones or scales have been seen.

(3) **Encephalartos villosus** Lem. Hutchinson & Rattray in Fl. Cap., V, ii, 30 (1933), in part; Stapf in Kew Bull. (1914) 390; Bot. Mag. t.6654; Marloth, Fl. S. Africa, I, Pl. 15B, Pl. 16B.

Nomenclature.—It has not been possible to check the older literature references and synonyms given in Flora Capensis. *E. striatus* Stapf & Burt Davy, reduced to *E. villosus* by Hutchinson and Rattray, is here restored, for reasons given later.

Distribution.—From Keiskama Hoek, Kingwilliamstown, to Natal, Swaziland and Delagoa Bay, but this range is incompletely covered by material in South African herbaria.

Specimens seen.—East London, *Smale* 23 (Herb. S.A. Mus.), *Rattray* 386 (Albany Mus. Herb.); Neads Camp, E. London, 400 ft., *Galpin* 3340 (Albany Mus. Herb., Herb. Bol., Nat. Herb.); Gonubie River mouth, E. London, *Galpin* 7767 (Nat. Herb.); Chalumna Causeway, E. London, female cones only, *Courtenay-Latimer s.n.* (Herb. N.B.G.); Kentani, 1,200 ft., *Pegler* 342 (Albany Mus. Herb., Herb. S.A. Mus., Herb. Bol., Nat. Herb.), 1,000 ft., *Pegler* 1124 (Herb. Bol.), *Pegler* 756 (Herb. S.A. Mus.); in woods near Kei mouth, 500 ft., *Flanagan* 1374 (Herb. S.A. Mus., Herb. Bol., Nat. Herb.); Port St. Johns, Natal, 600 ft., *Mogg* 13052 (Nat. Herb.); Stegi, Swaziland, *Keith s.n.* (Nat. Herb., Christian 604 in Herb. N.B.G.); Swaziland, *Nicholson s.n.* (Nat. Herb. 11413, Herb. Bol.). Cultivated plants in Kirstenbosch from East London; Keiskama Hoek, Kingwilliamstown Div.; Kentani; Ixotoba, Natal.

Description.—Stem subterranean or very short, usually not more than the woolly stem apex above ground (but a note on *Galpin* 3340 states that the stem is 5 ft. tall!). *Leaves* not glaucous, up to c. 280 cm. long, more or less erect and gracefully curved outwards, young leaves white woolly on rachis and on lower surface of leaflets, older leaves glabrous except for copious brown scaly wool at base of rachis; *leaflets* rather thin textured, spreading or recurved throughout length of leaf, usually spaced and not overlapping except slightly towards apex of leaf, reduced to prickles which often extend almost to the pulvinus, linear, broadly linear, or sometimes more or less linear lanceolate, up to c. 25 cm. long and 2.5 cm. broad, but usually not much more than c. 20 cm. long and 1.5 cm. wide; apex long narrowed and usually pungent, with a long pale spine, base gradually contracted; margins of nearly all leaflets sometimes quite entire, but more often both margins with a few (1—3) short forward pointing pungent teeth, the apex of the leaflet often 2—3-dentate; venation below fairly prominent but fine, c. 15—25 nerves in median leaflets. *Male cone* solitary or several together, very variable in height, very slender; peduncle variable, up to c. 20—22 cm. long, c. 4 cm. diam., yellowish green, thinly pale brown woolly; cone tapering slightly from about middle to apex, base shortly and slightly tapered, often up to c. 60—65 cm. long, 9—10 cm. diam., with c. 21 spirals of scales, general colour pale yellowish; emitting a strong unpleasant smell when ripe; scales at an upward angle from the cone axis, not at right angles as in most other species; *median scales* c. 4 cm. long and 3.3 cm. across widest part, c. 1.7 cm. wide at base, very shortly stipitate, body almost white, apices pale green, flattened, not beaked, more or less rhomboid, upper edge rounded, lower with short inconspicuous irregular teeth, glabrous except for a trace of minute reddish scaly hairs along lower

edge; cone curling up when dry. *Female cone* solitary or several together, oblong ovoid, up to c. 30 cm. tall and 12 cm. diam., peduncle up to c. 22 cm. long; exposed faces of scales flattened, not protruding, overlapping downwards, more or less rhomboid, almost smooth, lower margin

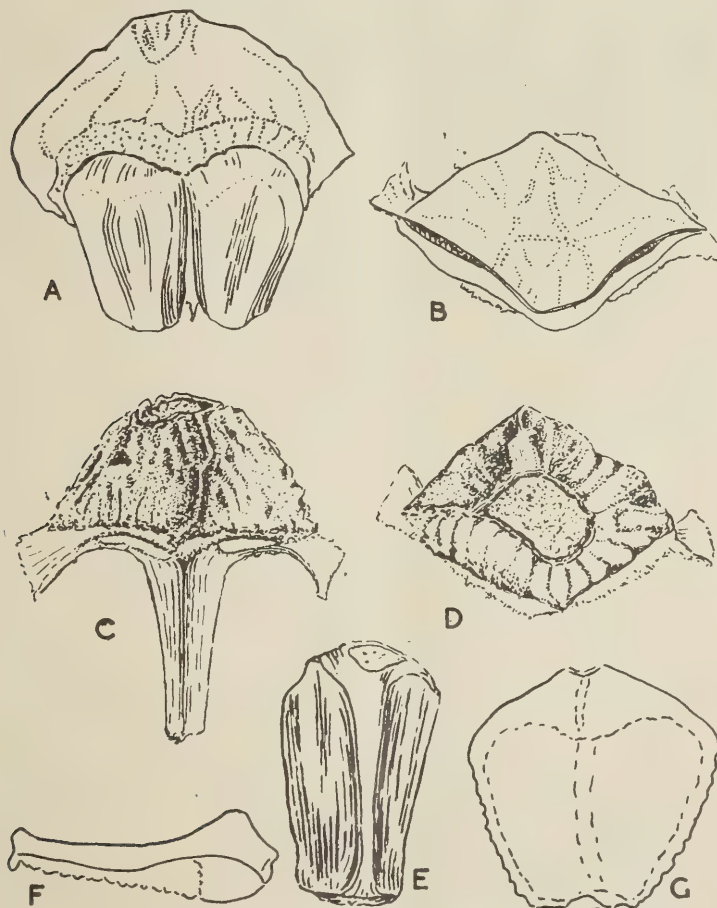


Fig. 2. A, B—*E. villosus*, median female scale and seeds of cone from Chalumna Causeway, E. London, from above and from front. C, D—*E. horridus*, median female scales from above and from front, E—seed. F, G—*E. horridus*, median male scale from side and from below.

About nat. size.

Del: M. P. Henderson.

irregularly toothed or more or less entire; *median scales* c. 4.5 cm. wide and 2.5 cm. vertically, stipe quadrangular, c. 2 cm. long, its angles crisped; *seeds* more or less oblong, c. 2.5 cm. long, sometimes longer, 1.8 cm. diam., scarlet.

Plants from Swaziland have much broader leaflets (up to c. 2.5 cm.) than those from further south, which are taken to be typical. Drawings and photographs in Nat. Herb. of the Swaziland plants and their female cones show that the cone tends to be somewhat taller and more slender than those seen on plants in Kirstenbosch.

(4) *Encephalartos striatus* Stapf & Burtt Davy in Burtt Davy, Fl. Transvaal, I, 40, 99, fig. 4, C, F (1926); Hutchinson & Rattray in Fl. Cap. V, ii, 30 (1933), *sub* *E. villosus* Lem.

This species is reduced to *E. villosus* Lem. by Hutchinson and Rattray. The only material available is a single sheet, and neither the exact locality (given by Burtt Davy as Pretoria) nor the collector can be traced.

Specimens seen.—Pretoria, Reid 4 (Nat. Herb.).

The type sheet (the only material known) consists of part of what is probably the central portion of a leaf, and two female cone scales without seeds, which look as if they had been dried under pressure. In general the leaf looks very like that of *E. villosus* except that it is more coriaceous. The scales differ from those of *villosus* in having dried pale and smooth, not blackish and wrinkled, the lower margin not toothed as is usual (but not invariable) in *villosus*, and narrower and perhaps more decurved scale apex.

In view of the fact that the plant is supposed to be a native of the Transvaal, which appears to have its own peculiar group of species, and because of the slight differences mentioned above, it is thought best to keep it separate as a dubious species in the hope that it may be rediscovered.

Burtt Davy mentions a plant offered for sale in the Pretoria market and reported by J. Medley Wood as having been grown by him in Durban, and says this may be *E. striatus*. No material of this has been seen in the Natal Herbarium.

(5) *Encephalartos horridus* Lehm., Pugillus, VI, 14 (1834); Hutchinson & Rattray in Fl. Cap., V, ii, 32 (1933).

Nomenclature.—There seems to be no nomenclatural confusion or difficulty with regard to this species, which was originally described, as *Zamia horrida*, by Jacquin in 1800.

Distribution.—This species has a very restricted distribution, being known only from the Addo Bush in the Uitenhage Division, Cape Province.

Specimens seen.—Despatch, Uitenhage Div., Rattray 1096 (Herb. S.A. Mus.); specimens from cultivated plants; living plants in Kirstenbosch from Port Elizabeth.

Description.—Hutchinson and Rattray describe the stem as "subterranean or very short". Most of the plants at Kirstenbosch have distinct aerial stems up to about a foot tall, with a tendency to lean over. They also remark that *E. horridus* and *E. latifrons* may be confused. In fact these two species are very distinct, both in the field and in the herbarium, and about the only character they have in common is their spiny lobed leaflets. *Leaves* up to c. 65 cm. long, glaucous, apices much recurved; petiole variable in length, up to c. 13 cm., base of pulvinus with brown wool; *leaflets* rather widely spaced in lower part of leaf, closer together above with at least the lobes overlapping, rigid, ovate lanceolate in general outline, lowermost leaflets reduced in size, the basal 1—4 pairs often entire, occasionally reduced to a single prickle, upper leaflets deeply cut on the lower margin into 1—3 spine tipped lobes; *median leaflets* up to c. 10 cm. long and 2.5 cm. wide, excluding lobes, lobes up to 4 cm. long; body of leaflet severely curled back, the lobes twisted out of the plane of the leaflet, apex of leaflet with long hard spine, base more or less contracted and decurrent; nervation below obscure. *Male cone* solitary, peduncle c. 8 cm. long and 3 cm. diam., surrounded at base by woolly bracts, yellow below, green above, with sparse grey wool mixed with reddish scaly hairs; cone up to c. 38 cm. tall, 10—11 cm. diam., narrowly fusiform, tapering gently to apex and base from about middle, general colour reddish brown, c. 15 spirals of scales. *Median scales* broadly obovate, c. 4 cm. long and 3.5 cm. greatest width, beak short and broad, projecting c. 1 cm. beyond sporangial surface, lateral angles acute, almost winged, upper angle rounded, sometimes with an ill-defined broad ridge, abruptly humped, lower angle rounded, surface smooth or lightly corrugate, apex irregularly rhomboid, shallowly excavate, smooth, up to c. 0.9 cm. across $\times$ 0.6 cm.; whole of beak covered with blackish or reddish adpressed scaly hairs over a pale green ground, body of scale pale yellow. *Female cone* oblong ovate to oblong ellipsoid, up to c. 40 c. $\times$ 20 cm. *Median scales* c. 4—4.5 cm. across base of exposed face, c. 3—3.5 cm. in vertical depth, exposed face protruding c. 2 cm., more or less quadrangular (but with occasional traces of 1 or 2 extra faces), the faces smooth or slightly corrugate, sloping up to a rather large more or less quadrangular flat apex c. 1.5 cm. diam., shallowly depressed, not hollowed, smooth or slightly rugose, surrounded by a narrow raised rim; upper and lateral angles rounded but with narrow sharp ridges, lower angle rounded and

slightly protuberant; surface of exposed face dull arsenic green with sparse mixed pale and blackish scaly hairs becoming more dense until they form a band of dark colour near junction with adjoining scales; interior part of scale with a narrow band of light green, then pale yellow, stipe c. 3.3 cm. long; seeds pale red or carmine, c. 3.5 cm. long, 2.4 cm. diam., more or less triangular in section with three flattened faces, hardly tapered to the wedge-shaped distal end, hilum unusually small.

(6) *Encephalartos latifrons* Lehm. Hutchinson & Rattray in Fl. Cap., V, ii, 36 (1933).

Nomenclature.—From the synonyms given by Hutchinson and Rattray this species has been confused with *E. horridus*. Hutchinson and Rattray themselves say that this is liable to happen and give a table of differences. In fact the two species differ very considerably, not only in general appearance but in details of leaf and cone characters.

Distribution.—This is a species of restricted distribution, the typical form at least being known only from the Uitenhage and Bathurst Divisions.

Specimens seen.—Near Paardepoort, Uitenhage Div., *MacOwan* 1379 (Herb. S.A. Mus.), *MacOwan s.n.* (Albany Mus. Herb.); Trappes Valley, Bathurst Div., *Rattray* 1100 (Herb. S.A. Mus., Herb. Bol.), *Rattray* 8439 (Nat. Herb.); East London, *Rattray* 1095 (Herb. S.A. Mus.), probably from a cultivated plant. Living plants in Kirstenbosch from Bathurst and Grahamstown (the latter possibly from a garden).

Description.—Kirstenbosch possesses a very fine collection of this rare species, the tallest plant having a stem 8—9 ft. high. Leaves when young finely pubescent all over, mature leaves glabrous, dark green, up to c. 90—100 cm. long, stiff, apex more or less recurved, sometimes completely curled back, petiole variable in length, up to c. 20 cm. long, pulvinus stout with conspicuous whitish collar; leaflets overlapping, the lower ones spreading and more or less reduced in size, but not to prickles, upper ones in a V and set very much across rachis, ovate, oblong-ovate or ovate-lanceolate, median ones largest, up to c. 14 cm. long and 6 cm. broad, base broad, apex rather abruptly acute with a short stiff dark brown spine; lower margin with usually not more than 4 deep, more or less triangular pungent lobes, upper margin entire or occasionally with 1 or 2 short pungent lobes, margin of leaflet thickened, nerves numerous and distinct below; lobes of leaflets abruptly bent back out of the plane of leaflet, or forward, or not bent, often all three conditions on same leaflet, the whole of the lower margin sometimes bent backwards or forwards in addition. *Male cone*: the only male cone so far seen on the Kirstenbosch plants was solitary, oblong-cylindric, c. 50 cm. tall, 16—17 cm. diam., nearly sessile, broadest near base, tapered

very slightly to apex, scale beaks very prominent, twisted sideways and downwards, beaks of uppermost scales slender, becoming shorter and thicker towards base of cone; general colour blue green. *Median scales*: body broadly oblong obovate, c. 4 cm. long to base of beak, c. 3 cm. greatest width, beak projecting c. 2 cm. beyond sporangial surface; body pale yellow, beak blue green, sparsely covered with adpressed red scaly hairs, strongly curved downwards and somewhat twisted sideways, lateral angles acute, or one acute and the other flattened, upper angle with a broad raised ridge, the lower angle with one or several raised striations, flattened apical part hardly excavate, variable in shape, but usually broader than deep, oblique. *Female cone*: apparently produced at long intervals, solitary (in the only specimen seen), oblong, sessile, narrowed to apex, c. 60 cm. tall, c. 23 cm. diam., general colour green; *median scales*: total length c. 8.5 cm., greatest width (about apex of stipe) c. 5.5 cm.; exposed face c. 4.5 cm. across at base, c. 3—3.5 cm. vertically, protruding c. 2—2.5 cm., more or less rhomboid or faintly hexagonal, appearing flattened dorso-ventrally, whole surface deeply cut into irregular pointed or blunt papillae, more evident on the upper surface where they tend to point backwards, less evident on lower surface and there tending to point forwards, the whole sparsely covered with pale brownish scaly hairs mixed with sparse dark brown scales over a yellowish green ground; lateral angles rounded to subacute, upper angle with a broad obscure ridge or sometimes with a narrow abrupt crest, lower angle rounded and slightly prominent or almost flat; apical umbilicus irregular in shape and size, usually c. 1—1.3 cm. diam., more or less excavate, sometimes deeply, its margins often protruding, its surface rugose but not so deeply cut as rest of exposed face; body of scale where adjoining adjacent scales yellow, very deep, c. 2.5 cm. from base of exposed face to apex of stipe (measured on lower surface), closely and shallowly rugose, sinus arms very short, their margins lacerate, stipe pale yellow, angled, c. 4—4.5 cm. long; *seeds* c. 5 cm. long, c. 2—2.5 cm. greatest diam., red, narrowly oblong, angled, slightly tapered to distal end. The upper scales protrude further than the median scales and have a smaller apical umbilicus, the basal scales hardly protrude, their apices with a large irregularly shaped flattened area.

This female cone was just erupting at the end of February, 1944. By September it was fully grown and it began to disintegrate at the end of November.

The main group of *latifrons* in Kirstenbosch is very uniform in general appearance, there being little variation in foliage characters between

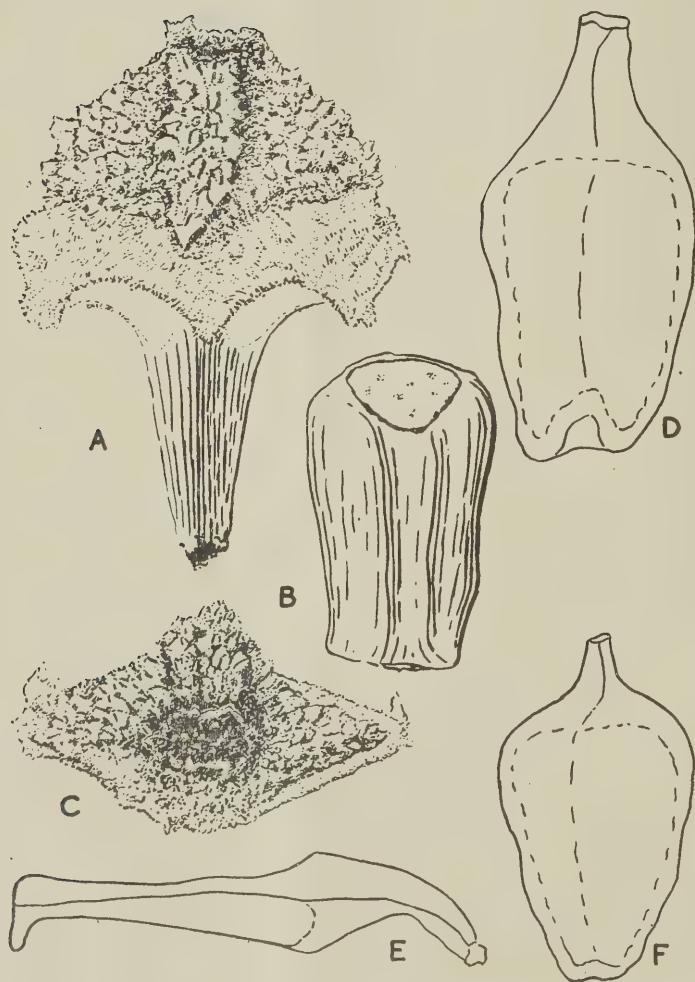


Fig. 3. A, C—*E. latifrons*, median female scale from above and from front, B—seed.
 D, E—*E. latifrons*, median male scale from below and from side. F—*E. sp.*
aff. latifrons, Henderson 1680, median male scale from below.
 About nat. size.

Del: M. P. Henderson.

the youngest plants with very short stems and the very oldest. There are, however, a number of other plants obviously closely related to the typical form of *latifrons* (assumed to be the plant from Bathurst), but differing from it to a greater or lesser degree, and differing among themselves.

There are two plants in the collection, one male and one female, which have been collected and numbered *Henderson* 1680 (male), and *Henderson* 2183 (female). These appear to constitute one group. Fresh male cones have been seen but only very old and weathered female cone scales. These plants have lost their labels, but a specimen from Kirstenbosch in the Bolus Herbarium agrees closely with *Henderson* 1680 and bears the Gardens number N.B.G. 2497A/16 and the locality Mount Coke, Kingwilliamstown. Another specimen in the Bolus Herbarium of what appears to be this group was collected by *Galpin s.n.* on the farm of Mr. W. C. Nachenius, De Kol, Alexandria district. The Cape Town Municipal Gardens possess plants from De Kol presented by Mr. Nachenius which are nearer to *Henderson* 1680 than to typical *latifrons*, but they have more widely spaced leaflets and the apex of the stem is not glabrous, but bears a quantity of loose light brown wool.

Description.—*Leaves* longer than those of typical *latifrons*, glaucous, the underside of leaflets in young leaves with a fine powdery tomentum, the petiole and rachis not softly tomentose as in young *latifrons*; leaflets longer in proportion to breadth, median leaflets c. 15.5 cm. long, 4—5 cm. broad, more closely spaced, lower leaflet margins and lobes not so abruptly bent back, leaf tips not abruptly recurved. *Male cones*: multiple, peduncle 3—4 cm. long, 4—5 cm. diam., green, with a few scattered bracts; cone 60—63 cm. long, greatest diam., about the middle, c. 15 cm., spindleshaped, tapering gradually from about the middle to each end, slightly curved, with 23—24 spirals of scales; *median scales*: body yellow, oblong to oblong obovate, c. 3.5—4 cm. long, 3—3.5 cm. greatest width, beak green, projecting c. 1.5 cm. beyond sporangial surface, nearly straight, lower surface with fine adpressed reddish scaly hairs, upper surface with only a few hairs near lateral angles and on apex; lateral angles acute, upper angle bluntly ridged and humped, lower angle with a definite but not very prominent narrow ridge, flattened apical part more or less quadrangular, 5—8 mm. across, but variable in size, vertically oblique, lower edge very slightly irregularly toothed, surface more or less smooth, not excavate; upper scales with longer beaks, beaks progressively shorter with larger and more decurved apices towards base of cone. This cone differs from that of *latifrons* in having slightly broader scales with a shorter and much straighter beak. The cone scales

of the female plant (*Henderson* 2183) seem to be very similar to those of *latifrons* in their general shape and rugosity, but the protruding apex appears to be longer, narrower and more abrupt.

Another female plant, also without particulars of origin, numbered *Henderson* 1562 differs only from *Henderson* 2183 in the somewhat shorter leaves, not glaucous but deep green when young, the leaflets somewhat less lobed. It differs from typical *latifrons* in the much narrower, less lobed leaflets, with the leaflet margins and lobes hardly twisted. Only very old cone scales of this plant have been seen, but they agree closely with those of *Henderson* 2183.

Another group is represented by *Henderson* 2017, a single young plant growing in permanent shade and of which no particulars are known. A specimen in the Albany Mus. Herb., from a plant cultivated in the Botanic Gardens Grahamstown, *Tidmarsh s.n.*, origin not stated, is very probably the same. Hutchinson and Rattray have determined this specimen as *E. latifrons* Lehm., but do not quote it in Fl. Cap.

Description.—Apex of stem just above ground. Leaves c. 124 cm. long, petiole c. 18 cm., pulvinus not very broad, more or less woolly, collar whitey-brown with reddish brown margin, not in a straight line across upper surface of pulvinus as in *E. latifrons* and most other species, but in an irregular V pointing to apex of leaf; rachis bluish green with slight bloom; apex of leaf twisted to one side and a little recurved, but not abruptly so; *leaflets* c. 29 pairs, dark green, not glaucous, little reduced at leaf base although there may be one much reduced basal leaflet, well spaced, lower ones not overlapping, median and upper overlapping slightly, those in lower half of leaf spreading, the upper in a V, nearly all flat or slightly recurved; median leaflets c. 12.5–13 cm. long, 4–5 cm. wide, general outline oblong ovate, the lower margin usually 3-lobed, upper margin very rarely lobed, lobes in same plane as leaflet or pointing inwards slightly, body of leaflet usually with a longitudinal fold, making the upper surface concave; base of leaflet broad, faintly paler green than rest of leaflet, not yellow; lobes pungent; lower surface of leaflet paler than upper, veins slender but quite visible, darker than surface, c. 40. No cones have been seen.

Differs from *latifrons* chiefly in the laxer leaves with more widely spaced leaflets of thinner texture, the lobes hardly twisted out of the plane of the leaflet.

E. latifrons is doubtless, like many other species, variable in foliage, but the differences pointed out above are rather striking, and they are accompanied in one instance by differences in the male cones. More collecting is obviously necessary, and careful comparison of female

cones from various localities may show that varietal differences at least, if not specific differences, exist.

(7) *Encephalartos kosiensis* Hutchinson in Kew Bull. (1932), 512; Hutchinson & Rattray in Fl. Cap., V, ii, 34 (1933); Compton in Hook. Icones, t. 3320 (1933); Ogilvie in Kew Bull. (1939), 655, Pl. IV.

Distribution.—From Zululand to Portuguese East Africa, usually near the coast. The most southerly record is from Kosi Bay, Zululand, but there is reason to believe that it extends considerably further south than this.

Specimens seen.—Near Kosi Lake, E. Ingwavuma Distr., Zululand, Aitken & Gale 63, type collection (Nat. Herb.); Kosi Bay, Zululand, *Lugge s.n.* (Nat. Herb. 16507); Zululand, *Nicholson s.n.* (Nat. Herb.); Kosi Bay, Zululand, cult. in Durban, *Forbes in Herb. Nat.* 26207, *Schweickerdt & Ogilvie in Herb. Natal.* 29875, 29876, 29877, 29878, 30434 (Herb. Natal.); Inhaca Island, 20 miles east of Lourenço Marques, Portuguese E. Africa, *Mogg* 17216, *Mogg, Moss & Weintraub s.n.* (Nat. Herb.); cult. in Lourenço Marques, *da Torre s.n.* (Nat. Herb.).

This species has been adequately described and figured by R. H. Compton and B. M. L. Ogilvie in the publications quoted above. Kirstenbosch possesses five well-grown plants. One, in slight shade, is more vigorous than the others, with larger leaves, the leaflets not reduced to prickles. One male cone has been seen, which when mature was deep shrimp pink to coral pink. One young female cone has also been seen, and this too was shrimp pink in colour, but it was injured in some way when young and did not mature. The female cones have been described elsewhere as vermilion, flaming scarlet, salmon red.

The male scales figured in Hooker, Icones t. 3220 show a prolongation of the lateral angles which has apparently been added to the original drawing by F. M. Leighton by the artist who prepared the plate for publication.

(8) *Encephalartos Lehmannii* Lehm. Pugillus VI, 14 (1834); Hutchinson & Rattray in Fl. Cap. V, ii, 34 (1933).

* *Nomenclature*.—If *E. Lehmannii* is accepted as defined by Hutchinson and Rattray, then there should be no nomenclatural difficulty. The basynym is *Zamia Lehmanniana* Ecklon & Zeyher (1833) a *nomen nudum*. An earlier name is provided by *Zamia pungens* Ait., Hort. Kew. V, 410 (1813). Lehmann transferred this to *Encephalartos*, apparently taking it to be distinct from *Lehmannii*. De Candolle, Prod. XVI, ii, lists it amongst *species dubiae*, but Hutchinson and Rattray reduce it to *Lehmannii*. From Aiton's description this appears to be the correct

disposition of it. The name *pungens* is not available for our plant, there being an earlier *Zamia pungens* Linn. fil. ex Salisb. Prod. (1796).

But a study of the large living collections in Kirstenbosch leads to the conclusion that *E. Lehmannii* sensu Flora Capensis is very probably a mixture of several closely related species. This view was held by older authors, to judge from the synonymy given in Flora Capensis, although for the most part their species were described from leaf specimens only. There are, therefore, names available for some at least of the segregates from *Lehmannii*, but the correct application of them will not be an easy matter.

The diagnosis of *E. Lehmannii* given by Lehmann is as follows: "*E. caudice glabro, rhachi subtetragono pinnisque pruinoso glaucis lanceolatis acutis mucronatis integerrimis glabris.*" This description would exclude forms with lobed leaflets, but it does not take us much further. Aiton's description of *E. pungens* indicates that it also is a form with entire leaflets, and he adds the significant phrase "*fructo nigro*". Of the four forms known with female cones there is only one to which this phrase could apply and it has entire leaflets. It is possible that *E. pungens* Ait. is an exact synonym of *E. Lehmannii*, in which case the name *E. Lehmannii* will be the one to use for the form which I have called "*A*" in this paper. But to prove this there must be a type specimen of *Lehmannii* with female cone scales. If there is not, the best procedure would seem to be to select the form "*A*" as the typical form and to apply to it the name *E. Lehmannii*.

E. spinulosus Lehm. may be applicable to one of the lobed leaflet forms. De Candolle, Prod. XVI, ii, 531 describes this as a variety of *E. Lehmannii* and says "*juniorum speciminum segmentis omnibus spinulosa dentatis. Probabiliter status juvenilis*". The difficulty will be to apply the name correctly, and it may not be possible to do so if female cones were not described. In short, although it is probably perfectly correct to assign to *E. Lehmannii* sens. lat. the names listed by Hutchinson and Rattray, these names cannot be interpreted accurately when the narrower view of *Lehmannii* is taken, unless their types, if they exist, embody female cone scales, or their descriptions describe them. It may, therefore, be necessary to describe as new at least three species hitherto regarded as *Lehmannii*, and possibly more, but, as explained later, further field work is needed before this can be done.

E. horridus var. *trispinosa* Hook., Bot. Mag. t. 5371, correctly assigned to the *Lehmannii* complex by Hutchinson and Rattray, is probably the form "*C*" described later in this paper.

Distribution.—The range of *E. Lehmannii* sensu Flora Capensis is from Willowmore Div. to Tsoma and Komgha, and from near the mouth

of the Kowie River, Bathurst Div., inland to Cradock and Queenstown.

Description.—From a study of the Kirstenbosch collections and herbarium material four forms with distinctive female cones have been recognised. Two of these, forms "A" and "D", have leaflets which are all or nearly all entire, the other two, forms "B1" and "B2", have many leaflets conspicuously lobed.

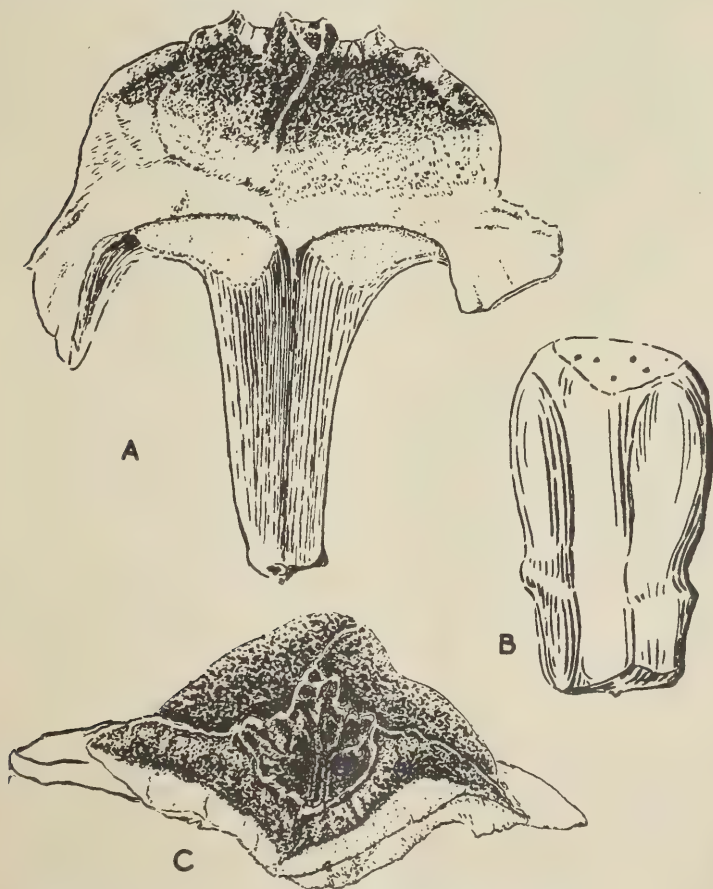


Fig. 4. *E. Lehmannii*, form "A". A—female scale from above. B—seed. C—scale from front. A and C about nat. size, B a little enlarged.

Del: M. P. Henderson.

Form "A."—Plant with stout stem, suckering freely; *leaves* c. 90—120 cm. long, apex recurved and often twisted sideways, petiole c. 25.5 cm. long with a very stout pulvinus brown woolly at base, and with a conspicuous red-brown collar, the whole leaf dull blue green, green when very old; *leaflets* not crowded, hardly overlapping except slightly at leaf apex, median ones up to c. 18 cm. long, 1.8 cm. broad, pungent, terminal spine 5 mm. or more long, those in basal half of leaf spreading and somewhat recurved, those of upper 1/3 in a V; upper and lower margins more or less equally narrowed to apex; leaflets entire, except occasionally on leaves of young suckers, venation below fine but distinct. *Female cone* solitary, nearly sessile, ovate oblong, apex narrowed, c. 48 cm. tall and 22—23 cm. diam., general colour blackish red, sometimes with the scale apices greyish; *median scales*: exposed face more or less rhomboid, c. 6 cm. across and 3.5 cm. vertically, protruding c. 2 cm., upper and lower angles rounded, nearly equal, the lower a little more obtuse and prominent, a narrow raised line from centre of upper angle to centre of upper margin of apical umbilicus, lateral angles acute to winged; apical umbilicus rather irregular in shape, c. 1.5—1.8 cm. across, 1—1.5 cm. vertically, hardly excavate, its upper margin more or less winged and projecting, surface very lightly and inconspicuously rugose; surface of exposed face smooth, blackish because of a dense coat of blackish scaly hairs over a green ground, these hairs stopping abruptly near base of exposed face, leaving a green band 0.5—1 cm. deep which changes rather abruptly into the pale yellow of the inner part of scale; stipe pale yellow, angled, c. 3.5—4 cm. long, sinus arms short, less than $\frac{1}{4}$ length of seed; sinus c. 1.5 cm. across; *seeds* pale coral red, becoming more yellow at distal end, angled, compressed, c. 4.7—5 cm. long, 2.5—2.8 cm. greatest diam.

Specimens seen.—One plant cultivated at Kirstenbosch, exact origin unknown, *Henderson* 1445 (Herb. N.B.G.); Jansenville Div., *McLaughlin* 16032 (Herb. Bol.)—the leaflets in this specimen with 1—2 short spine-tipped teeth on lower margin, the female cone rather young, but with smooth scales.

Form "D."—Plant with stout stem. *Leaves* resembling those of form "A" but differing slightly in appearance and in certain minor characters; c. 90 cm. long (shorter than in "A"), apex slightly recurved and twisted sideways, petiole 15—21 cm. long, more slender than in "A" with a less stout pulvinus and collar of a dirty white, whole leaf bright blue green, becoming duller with age, rachis yellow green, leaflet bases yellowish; *leaflets* hardly overlapping except in upper part of leaf, linear lanceolate, entire or nearly so, median ones up to c. 14 cm.

long and 1.3 cm. broad, pungent, terminal spine rarely as much as 4 mm. long, basal leaflets more reduced in size than in "A," and all in a very regular V from base to apex, not spreading or recurved; slightly falcate; venation below rather indistinct, very fine. *Female cones* multiple, oblong, more or less abruptly subacuminate due to 5—7 spirals of reduced scales at apex; *median scales*: greatest width c. 4.5 cm., greatest depth vertically c. 3.5 cm., length from base of stipe to apex of

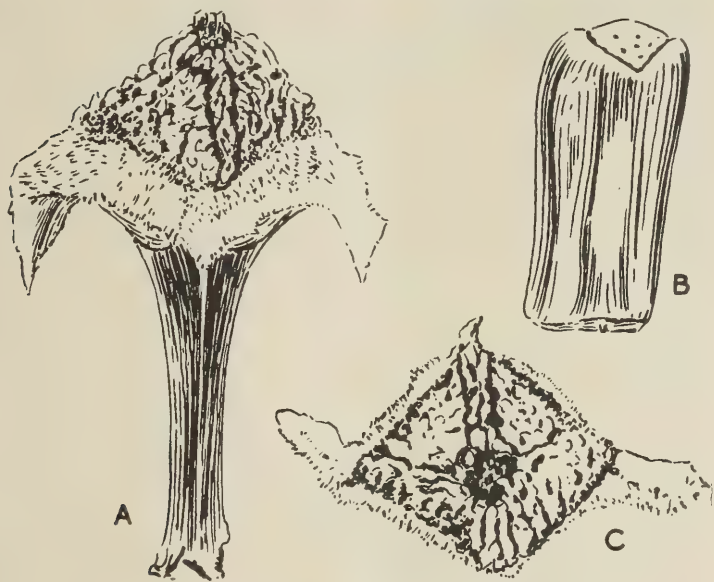


Fig. 5. *E. Lehmannii*, form "D". A—female scale from above. B—seed. C—scale from front. About natural size.

Del: M. P. Henderson.

scale c. 7 cm., sinus arms variable but usually less than half length of seed; exposed face protruding c. 2 cm., dull green, c. 3.5 cm. across and 3.3—3.4 cm. vertically, lateral angles rounded, not ridged or winged, lower angle broadly rounded, somewhat projecting, upper angle usually with two rather obscure ridges c. 1 cm. apart, forming a flat ridge of that width, or sometimes with one ridge centrally, or with a central ridge and a very obscure one to one side; surface all over cut into deep irregular elongate papillae with rounded tips, closely packed together and pointing

forward, covered with a sparse tomentum of whitish and brownish scaly hairs; apical umbilicus shallowly excavate, well marked by its raised rim, more or less orbicular, or roughly triangular, or more or less quadrate, not more than c. 1.5 cm. across and 1 cm. high, rugose, but not so deeply cut as rest of exposed face; inner part of scale body slightly reddish yellow shading to pale yellow, c. 1—1.5 cm. from base of exposed face to apex of sinus; stipe pale yellow, angled, c. 3.5 cm. long; seed cochineal red, c. 4 cm. long, 2 cm. diam., angled, tapering to wedge shaped distal end.

Specimens seen.—One plant cultivated at Kirstenbosch, exact origin unknown, *Henderson* 1645 (Herb. N.B.G.); valley of the Zwart Kei, Queenstown Div., *Galpin* 8090 (Herb. S.A. Mus., Nat. Herb.); near junction of Kabusie and Kei rivers, near Komgha, *G. G. Smith* 5761 (Herb. N.B.G.)—a fresh, not quite ripe female cone and photograph of plants.

Form “Bl.”—Plant with stout stem (up to c. 90 cm. in Kirstenbosch plants); leaves c. 90 cm. long, blue green, apex markedly recurved and more or less twisted sideways, pulvinus with dirty white collar, petiole c. 18—20.5 cm. long; leaflets not overlapping except to some extent in upper part of leaf, slightly reduced at base, median ones up to c. 15.5 cm. long and 1.5 cm. wide, linear lanceolate or linear oblong (excluding lobes), often slightly falcate, gradually tapering to a stiff apical spine 5—6 mm. long, lower leaflets usually entire, or occasionally with one or two narrow, deep, spine tipped lobes on lower margin, the upper leaflets usually with 1—3 similar lobes on lower margins, the lobes usually twisted out of the plane of the leaflet. *Female cone* solitary, almost sessile, oblong, narrowed at apex, 48—50.5 cm. long, c. 18 cm. diam., with 3—4 spirals of sterile scales at apex, general colour blue green or yellowish green, with sometimes an arsenic green or yellow green zone at base of exposed face; *median scales*: greatest width c. 6.5 cm., greatest depth vertically c. 4 cm., length from base of stipe to apex of scale c. 9 cm.; exposed face c. 5—6 cm. across, 3.5—4 cm. vertically, protruding c. 2.5—3 cm., upper angle rounded but marked by a raised rugose ridge, lower angle depressed, lateral angles acute, sometimes almost winged, surface deeply rugose with irregular pointed rugosities, sparsely adpressed whitish scaly hairy; apical umbilicus prominent, margins protruding, its surface excavate and smooth or slightly pitted, nearly glabrous or with sparse white scaly hairs, quadrangular or nearly orbicular in outline, usually c. 1 cm. diam.; body of scale where adjoining adjacent scales c. 1 cm. deep, stipe c. 5—5.5 cm. long, angled, pale yellow, sinus up to c. 2 cm. across, sinus arms c. 2—2.5 cm. long, irregular in shape, acute, sharply 3-angled, the outer or sometimes

all angles winged and irregularly toothed ; seeds c. 5 cm. long and 2 cm. diam., oblong, truncate at both ends, slightly tapered to distal end and there wedge shaped, reddish orange to yellow orange with a semi-translucent band of dirty orange at distal end, 1.5—2 cm. deep.

Specimens seen.—Living plants in Kirstenbosch, exact origin unknown, Henderson 1644, 2026 (Herb. N.B.G.) ; north slopes of Bothasberg, near

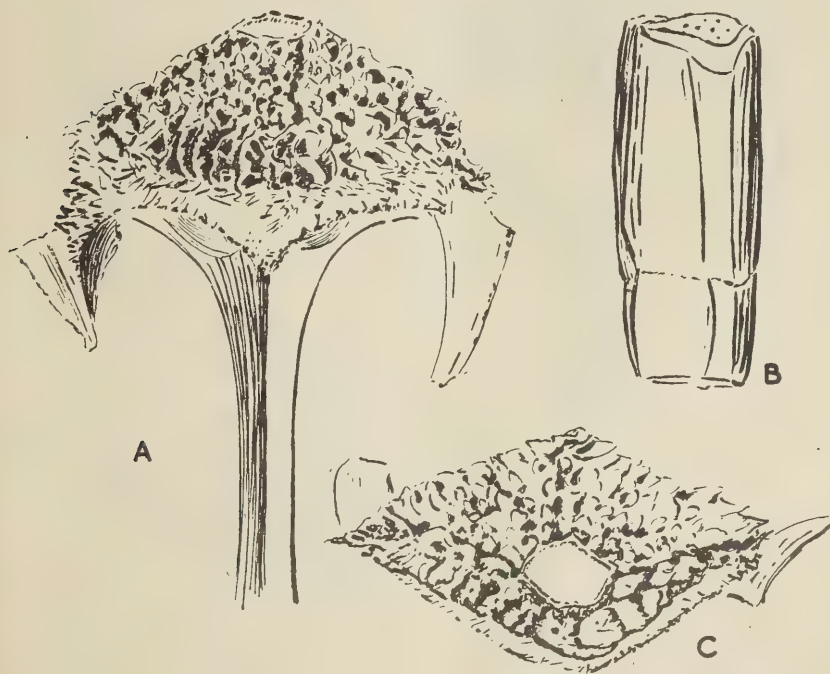


Fig. 6. *E. Lehmannii*, form "B1". A—female scale from above. B—seed. C—scale from front. A and C natural size, B a little enlarged.

Del: M. P. Henderson.

Grahamstown, Galpin 3083 (Herb. Bol., Nat. Herb.) ; cult. in Municipal Gardens, Cape Town, origin not stated, Chalwin 849 (Herb. S.A. Mus.).

Form "B2".—Plant with stout aerial stem, in the Kirstenbosch plant c. 60 cm. tall with domed apex. *Leaves* c. 90 cm. long, closely resembling those of form "B1", but usually with somewhat less lobing of the leaflets, the lobes less twisted out of the plane of the leaflet. *Female*

cone solitary, almost sessile, ovate oblong, narrowed at apex with 3—4 spirals of reduced scales, general colour yellowish. *Median scales*: exposed face more or less quadrangular-rhomboid, c. 4.5—5 cm. across and 3.5—4 cm. vertically, protruding 1—1.5 cm., pale blue-green with slight yellowish tinge, the yellow sometimes evident at base of free face, surface minutely white dotted and with a few scattered adpressed white scaly

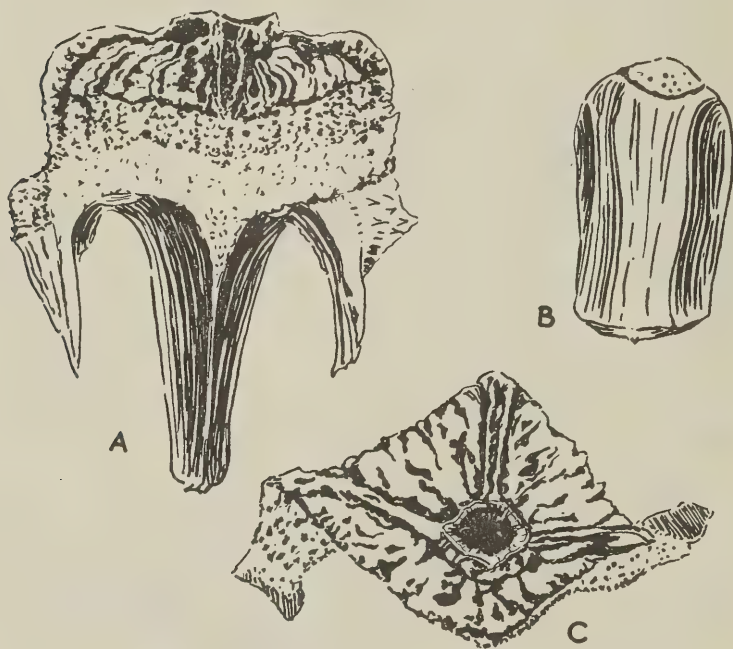


Fig. 7. *E. Lehmannii*, form "B2". A—female scale from above. B—seed. C—scale from front. About natural size.

Del: M. P. Henderson.

hairs, rough with rounded ridges and bumps tending to radiate from apical umbilicus, but not deeply rugose as in "B1"; apical umbilicus below centre of face, more or less orbicular, c. 1—1.3 cm. diam., shallowly excavate, margin slightly raised, protruding little, smooth; upper angle rounded and rather obscurely ridged, sometimes with two parallel obscure or fairly well defined ridges, lower angle depressed, not ridged, lateral angles acute, running slightly upwards from apical umbilicus; stipe pale yellow, stout, c. 3.5 cm. long, sinus arms triangular, winged on angles,

c. 2—2.4 cm. long, sinus c. 2 cm. across, but often smaller, one sinus often smaller than the other; body of scale where adjoining adjacent scales pale or dirty yellow, up to c. 2 cm. deep; seeds scarlet or dark orange red, more or less elliptic in section at proximal end, becoming somewhat paler towards distal end and there narrowly oblong in section, up to c. 4 cm. long and 2 cm. diam.

Specimens seen.—One plant cultivated at Kirstenbosch, origin unknown, Henderson 1981 (Herb. N.B.G.). No herbarium material from wild plants has been seen which can safely be assigned to this form.

Of the four forms described above, one individual of Form "A" has been seen. This plant is very vigorous with many suckers and has produced, from suckers and main stem, 3 cones in the past two years. Of "B1" two individuals have been seen, with one cone each, and of "B2" and "D" one individual each, the first with one cone, the second with three simultaneous cones.

In addition to the above four forms there are at Kirstenbosch two further forms which have been distinguished mainly on foliage characters. Unfortunately only male plants have so far been seen of them.

Form "C".—This differs from other forms with lobed leaflets in the larger and laxer leaves, with more widely spaced, less lobed and longer leaflets. Leaves up to c. 90 cm. long, apex more or less recurved, and often twisted sideways, blue-green, glaucous, green when old, petiole variable in length, up to c. 30 cm., pulvinus stout with conspicuous dirty-white collar; leaflets spaced, only the lobes in upper part of leaf overlapping, linear lanceolate, median ones up to c. 18 cm. long, 2 cm. broad, upper surface concave, slightly contracted at base and there pale yellow, apex long narrowed into a stiff pale yellow, or pale yellow tipped dark brown, spine usually over 5 mm. long, leaflets in a wide V, the lower sometimes spreading but not recurved, basal ones reduced somewhat in size, but never to prickles or lobed; leaflets in upper 1/3 of leaf with 1—3, usually 1, rarely 3, deep narrow lobes up to c. 4 cm. long on lower margin, pungent like apex of leaflet, the lobes often but not always twisted out of plane of leaflet; in some leaves many of the upper leaflets entire; venation below fine but distinct, c. 21 nerves in median leaflets. The only male cone yet seen was narrowly cylindric fusiform, tapered very gently from about middle to apex and base, c. 33 cm. long, 7.5 cm. greatest diam., peduncle c. 4.5 cm. long, partly hidden by woolly bracts; general colour of cone green; c. 22 spirals of scales; median scales broadly obovate oblong, c. 3 cm. long and 2.3—2.4 cm. greatest width, body pale yellow, margins irregularly wavy, beak projecting c. 0.9—1 cm. beyond sporangial surface, green, lightly wrinkled, almost smooth,

glabrous except for a few scattered whitish scaly hairs near base and dark scaly hairs near apex; lateral angles more or less acute, almost winged, upper angle humped and rounded, lower angle with a more abrupt hump and a faint ridge; flattened apex of beak more or less quadrangular or rhomboid, hardly excavate, smooth or nearly so, 0.4—0.5 cm. diam., margin not toothed. Lower scales wider in proportion to length, with

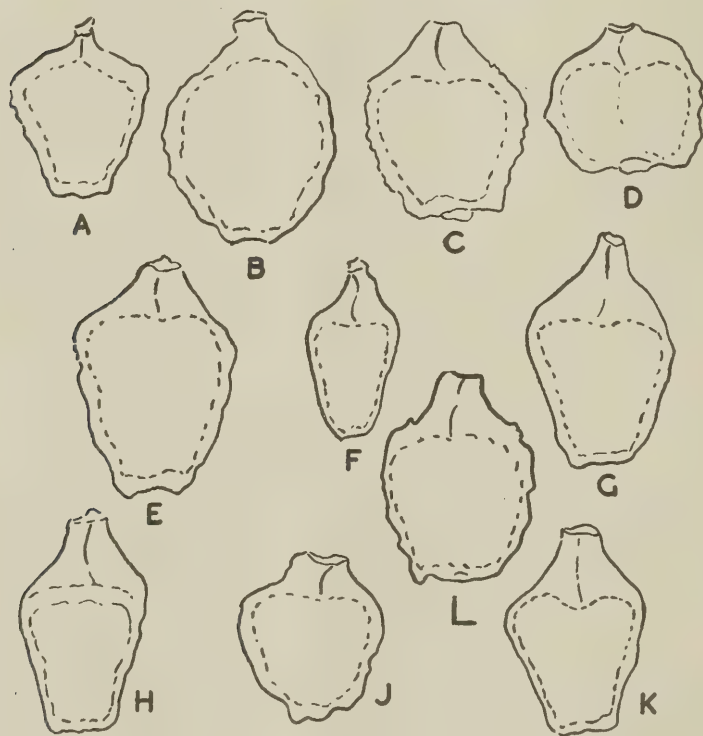


Fig. 8. *E. Lehmannii*, male cone scales.

A—Henderson 1595; B—MacOwan 1959; C—Henderson 2025; D—Henderson 2025, basal scale; E—Henderson 2005; F—Henderson 1594; G—Henderson 2006; H—Henderson 1444; J—Henderson 1444, sucker cone; K—Henderson 2008; L—Henderson 1590.

larger flattened apex of which the lower margin tends to become irregular and projecting.

Specimens seen.—Two plants in Kirstenbosch, exact origin unknown, Henderson 1513, 2025 (Herb. N.B.G.), Fig. 8, C. No herbarium material

from wild plants has been seen which would fit exactly this form. *E. horridus* var. *trispinosa* Hook., Bot. Mag. t. 5371 probably belongs here.

Form "F".—Differs from "A" and "D" in the very narrow upright leaves with the leaflets pointing upwards but the basal ones not in a V, apex of leaf rather abruptly recurved, leaflets short, very crowded, with a tendency to have short spine tipped lobes on the lower margins, especially at apex of leaf; petiole short. No fresh male cones have yet been available.

Specimens seen.—At least two plants in Kirstenbosch, exact origin unknown, *Henderson* 1444, 2008 (Herb. N.B.G.), Fig. 8, H, J, K. No herbarium material from wild plants has been seen which can be assigned to this form.

An attempt has been made, with practically no success, to assign various male plants in the *Lehmannii* group cultivated at Kirstenbosch to the four female forms. Although there are differences in foliage between forms "A" and "D", it has not been found possible to say with certainty whether male plants with entire leaflets belong to either of them; nor can one say whether male plants with lobed leaflets belong to forms "B1" or "B2". Exact records of the origin of each plant might have solved the difficulty, but these are not available, and so a considerable amount of field work will be necessary not only to correlate the sexes of the various forms but also to map their areas of distribution.

There are considerable differences in cone shape and in shape of scales in the male plants at Kirstenbosch and it has been thought advisable to record briefly what has been learnt. The outline sketches have all been made from median scales of dried cones.

Forms with entire leaflets.—*Henderson* 2005 (Herb. N.B.G.), Fig. 8, E. In foliage this resembles "A" rather than "D". The scales differ from those of "F" (Fig. 8, H, J, K.) in tending to have the flattened apex of the beak deeper than wide, but the differences are small and difficult to describe.

Henderson 1594, 2006 (Herb. N.B.G.), Fig. 8, F, G. These resemble "D" in foliage. The beak of the median scales tends to be narrower and relatively more prominent than in form "F" or in *Henderson* 2005 (Fig. 8, E), and it appears to be less wrinkled.

Forms with lobed leaflets.—*Henderson* 1595 (Herb. N.B.G.), Fig. 8, A. This cone is very distinct from all others seen in its shape—broadest above middle, tapering gradually to base and more abruptly to apex, and in the shape of the scales, which have a much shorter and more abrupt beak than usual, with a more pronounced downward curve.

The sporangia are visible at the base of the beak just before the cone elongates, which is not the case in other *Lehmannii* cones.

Henderson 1590, 2146, 2147, 2148 (Herb. N.B.G.), Fig. 8, L. A group of five plants, whose origin cannot now be traced have been planted some distance away from the main *Lehmannii* group in Kirstenbosch. They vary a little amongst themselves, due mainly to differences in vigour of growth, and there is little doubt that they belong to *Lehmannii*, form "B." Only one male cone has been seen and the scales differ in shape rather markedly from those of *Henderson* 1595 and *MacOwan* 1959, the only others in the "B" group of which male cone scales have been seen. The cone (of *Henderson* 1590) is c. 31 cm. long, c. 9.5 cm. greatest diam., more or less cylindric, gradually tapered from just below middle to apex and base, slightly curved, c. 17 spirals of scales, general colour dull pale amber yellow; peduncle c. 5 cm. long, thinly whitish woolly, basal 1/3 or 1/4 hidden by short erect woolly bracts; *median scales* broadly obovate oblong, c. 3.5 cm. total length, c. 2.4 cm. greatest width, beak projecting c. 0.8—0.9 cm. beyond sporangial surface; margins of scale body and lower parts of lateral angles irregularly toothed, upper angle abruptly humped with a raised ridge running to apex of beak, lower angle rounded or slightly humped; apex of beak with an irregularly quadrate or hexagonal flattened area c. 0.5 cm. diam., smooth, hardly excavate, lower margin very slightly toothed in basal scales; beak almost glabrous, with a few scattered white scaly hairs.

The forms with entire or nearly entire leaflets, therefore, have male cone scales which are all similar, so far as material has been available. On the other hand, the forms which might be assigned to "B1" or "B2" have scales which differ amongst themselves rather markedly and differ also from the entire leaflet forms. The scale of form "C" resembles one of the "B" forms.

In addition to the herbarium material so far enumerated, the following has also been seen:—

Lobed leaflet forms.—Mouth of Kowie River, 250 ft., Bathurst Div., *MacOwan* 1959 (Herb. S.A. Mus.). This specimen consists of two pairs of very deeply lobed leaflets and a section of a mature male cone. The scales differ from others in being broader and more ovate. They are c. 3.5 cm. long, c. 2.5 cm. greatest width, beak projecting beyond sporangial surface 0.6—0.7 cm., upper angle of beak prominently ridged, flattened apical part rather large, irregular in shape. (Fig. 12, B). Penrock Farm, 10—12 miles from Grahamstown, *Dyer* 1184 (Albany Mus. Herb.); near Fish River, 1,800 ft., *MacOwan* 1380 (Herb. Bol.).

Entire leaflet forms.—West of Miller station, 950 m., Willowmore Div., *Andreae* 999 (Nat. Herb.), ? form "A"; Ratelsberg, about 7 miles north of Jansenville, *Dyer* 4011 (Nat. Herb.), ? form "A"; Cranmere, Pearston Div., *Palmer s.n.* (Nat. Herb.), ? form "A"; Enon, Uitenhage Div., *Thode* A2758 (Herb. Natal., Nat. Herb.), ? form "A" or "D"; northern slopes of Zuurberg, near Paardepoort, 1,800 ft., *Bolus* 1875 (Herb. Bol.), ? form "A"; Junction Farm, Queenstown, *Rattray* 1274 (Albany Mus. Herb.), ? form "F"; rocky slopes near Komgha, *Flanagan* 1373 (Herb. Bol., Herb. S.A. Mus., Nat. Herb.), ? form "D"; living plant from 1½ miles east of Kei Bridge, *Courtenay-Latimer s.n.*, ? form "D."

At present only a tentative mapping of the various forms of *Lehmannii* can be attempted. It looks as if form "A" were restricted to the western part of the area, from Willowmore Div. to about as far east as the longitude of Port Elizabeth. The "B" forms seem to have their main centre near Grahamstown, with form "B1" definitely recorded from that area, and also near Queenstown. Form "D" is definitely recorded from near Queenstown and near Komgha but it may also come as far west as the Uitenhage Division and overlap with "A." The distribution of form "F" is much more uncertain, but it may occur near Queenstown and no specimens which look like it have been seen from further west. Much field work, therefore, remains to be done.

It is perhaps hardly necessary to point out that the descriptions of the forms enumerated above have been drawn up from a small number of plants in each case and that their foliage characters in particular may vary to a greater degree than the descriptions allow for. It is quite possible, for instance, that plants of forms "A" and "D" may be found with many of the leaflets dentate, but it is not expected that these forms will show deeply lobed leaflets as in "B1" or "B2."

(9) *Encephalartos Eugene-Maraissii* I. C. Verdoorn in Jour. S.A. Bot. XI, i, 1 (1945), Pl. I.

This Transvaal species, described and figured earlier in this Journal by Miss I. C. Verdoorn, is allied to *E. Lehmannii* form "A", but it can be distinguished from any form of *Lehmannii* by the incurved leaf rachis, which gives the profile of the leaf the shape of a boat or canoe.

Kirstenbosch possesses one young plant which, as this paper passes through the press, is producing three female cones. These, in five weeks, have reached a height of about 27 cm. and are still very young. The scales are deep red brown over a green ground colour and in this respect at least differ from those of *Lehmannii* form "A".

(10) **Encephalartos longifolius** Lehm. Pugillus VI, 14 (1834) ; Hutchinson and Rattray in Fl. Cap. V, ii, 38 (1933) ; *E. caffer* Hook., Bot. Mag. t. 4903.

Nomenclature.—*E. longifolius* as accepted today is quite a distinctive species, at least in the field. Dried leaf specimens might be confused with those of *E. Altensteinii*. The name *E. caffer* was at one time applied to *longifolius* due to the confusion in the original description of *Cycas caffra* Thunb. (see p. 13). The species was originally described by Jacquin in 1809 as *Zamia longifolia*. At the same time he described *Z. lanuginosa*, which Lehmann in transferring to *Encephalartos* (Pugill. VI, 14 (1834)) describes as follows: "*E. caudice lanuginoso rhachi tetragono pinnisque viridibus lanceolatis acutis mucronatis glabris medio extus profunde spinoso bidentatis*." This description of the stem hardly fits *E. longifolius*, but Hutchinson and Rattray seem justified in their reduction of *lanuginosus* to *longifolius*. Lehmann, when describing *E. Altensteinii* says that it is allied to *E. lanuginosus*. Index Kewensis reduces *E. caffer* Lehm. to *E. lanuginosus*, a reflection, no doubt, of the misapplication of the name *caffer* to *longifolius* and so a confirmation of Hutchinson and Rattray's reduction. De Candolle, Prod. XVI, ii, lists *E. lanuginosus* under *species dubiae*.

Distribution.—Assegai Bosch, Humansdorp Div., to Grahamstown.

Specimens seen.—Assegai Bosch, Humansdorp Div., Rattray 1277 (Albany Mus. Herb.) ; Hankey, north-east of Humansdorp, Paterson 19 (Albany Mus. Herb.) ; Uitenhage Distr., Ecklon s.n. (Bol. Herb.) ; Uitenhage (?cultivated), ?coll. 848 (Herb. S.A. Mus.) ; Van Staadens, Rattray 1097 (Herb. S.A. Mus.) ; Zuurberg, treeless slopes, Bracken s.n. (Christian 600 in Herb. N.B.G.) ; Fish River, valley, Albany, Dyer 3238 (Nat. Herb.) ; junction of roads from Grahamstown and Sidbury to Alicedale, Hoeg s.n. (Albany Mus. Herb.) ; Howiesons Poort, Grahams town, MacOwan 1377 (Herb. Bol.) ; Botanic Gardens, Grahamstown, origin not stated, Tidmarsh s.n. (Albany Mus. Herb.) ; a number of plants in Kirstenbosch, all rather young and with short stems.

Description.—*Leaves* blue green with recurved tips, and rigid, thick textured almost entire broad leaflets ; leaves finely pubescent when young, c. 160 cm. long, or less or more, petiole usually 30—35 cm. long but sometimes only 15—16 cm. ; *leaflets* variable in size and shape, from ovate lanceolate near base to oblong lanceolate or linear oblong above, reduced in size at leaf base, sometimes to prickles, rigid in texture ; median ones largest, up to 20 cm. long and 4 cm. wide, lower often spreading, upper in a V and set very much across the rachis, bases shortly contracted and yellowish, apices pungent or blunt, sometimes with an abruptly hooked tip, entire or with the lower margin, especially of upper leaflets,

with 1—3 short, pungent or bluntly rounded lobes. *Male cone* c. 53.5 cm. tall, c. 14 cm. diam., nearly sessile, more or less ovate lanceolate, general colour greenish brown, scale beaks very prominent, tending to twist sideways, lowermost broad and blunt, uppermost narrow, tending to point upwards; *median scales* obovate acuminate, total length c. 3.8 cm., width at widest point c. 3.8 cm., width at base c. 2 cm., upper surface of scale body more or less flat, pale yellow, sporangial surface with broad raised central ridge, sporangia covering nearly all lower surface, leaving only a narrow margin; beak projecting c. 2 cm. beyond sporangial surface, upper angle rounded and markedly humped at base, lateral angles acute, running up to apex of beak as narrow, hardly raised ridges,

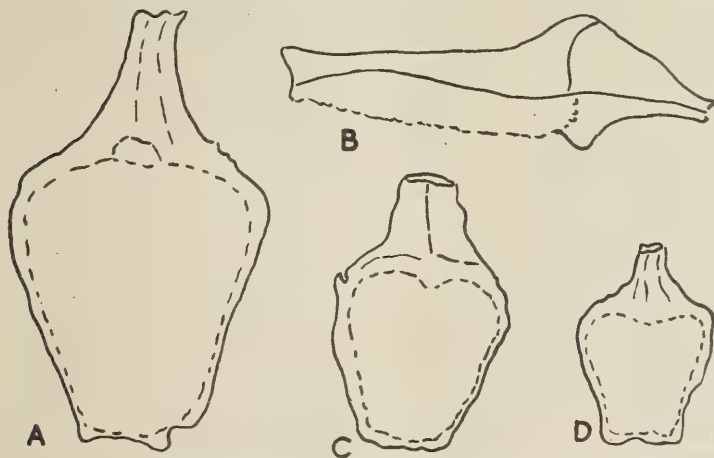


Fig. 9. A, B—*E. longifolius*, median male scale from below and from side. C, D—*E. Altensteinii*, median male scales from below. Nat. size.

lower angle rounded, markedly humped; flattened apical portion small, more or less oblique, c. 8—9 mm. across $\times$ 3—5 mm., margin irregular; beak often twisted sideways and usually with a downward curve, covered with reddish adpressed scaly hairs over a green ground. No female cone has yet been available.

(11) *Encephalartos Altensteinii* Lehm., Pugillus, VI, 11 (1834), t. 4, 5; Hutchinson and Rattray in Fl. Cap. V, ii, 39 (1933), in part; Marloth, Fl. S. Africa, I, Pl. 15A, Pl. 16A (very young female cones).

Nomenclature.—Although a number of synonyms are given in Fl. Cap., they appear to be mostly horticultural names or names without

description, and no confusion arises. *E. transvenosus* Stapf and Burt Davy, reduced to this species by Hutchinson and Rattray, is now regarded as distinct. *E. Altensteinii* was first described and figured by Lehmann, from leaf specimens only.

Distribution.—From the Kowie River, Bathurst, C.P., to Natal and Zululand. The Transvaal record in Fl. Cap. is presumably based on *E. transvenosus*.

Specimens seen.—Kowie, West River, Bathurst Div., Britten 5752 (Herb. Bol.); Trappes Valley, Bathurst, coll. D. Jones-Phillipson, cult. in Hort. H. B. Christian (*Christian* 567 in Herb. N.B.G.); Bathurst, C.P., Rattray 1099 (Herb. S.A. Mus.); mountains near Howiesons Poort, Grahamstown, MacOwan 1376 (Herb. Bol.); Kingwilliamstown, Sim 847 (Herb. S.A. Mus.); Fort Murray, East London, Courtenay-Latimer s.n. (Herb. N.B.G.); woods near Komgha, 2,000 ft., Flanagan 1372 (Herb. S.A. Mus., Herb. Bol., Nat. Herb.); Kobongkoba River, Kentani, Pegler 1116 (Albany Mus. Herb., Nat. Herb.); Kentani, Pegler 755, 1346 (Herb. S.A. Mus.); Kei Road, Rogers 3225 (Albany Mus. Herb.); cult. in Botanic Gardens, Durban, ex Zululand, Forbes s.n. (Nat. Herb., Herb. N.B.G.); valley of 1000 Hills, Inchanga, Natal, fide H. M. L. Forbes (no specimens seen); various specimens from cultivated plants. The large Kirstenbosch collection contains plants introduced from Kingwilliamstown, East London, Bathurst, Kentani and Natal.

The herbarium material available is scanty considering the range of the species. No specimens from wild plants in Natal have been seen.

Description.—The stem is said by Hutchinson and Rattray to reach about 16 ft. Although there is a considerable range of variation in leaf size and in shape and size of leaflets in the large Kirstenbosch collection, there is not much difficulty in distinguishing the species at a glance from any other S. African species except perhaps *E. transvenosus*. Young and vigorous sucker leaves might be confused with *transvenosus*. The leaflets vary greatly in shape and size and spininess, from linear oblong, slightly falcate, entire, 13 cm. $\times$ 1 cm., to ovate lanceolate, 16 cm. $\times$ 4 cm., with prominent pungent teeth on both margins, or without teeth. The teeth may be near the leaflet base, scattered along the margin, or near the apex, and there may be as many or more on the upper margin as on the lower. There are usually not more than 4 teeth on each margin and they may be reduced to very short blunt rounded knobs. The basal leaflets are more or less reduced in size, but rarely become prickles. *Male cones* usually multiple. In one plant in Kirstenbosch which has two heads there were in April, 1943, five cones on one head and four on the other, the group of five ripening together a few days before the group of four. *Peduncle* very stout, c. 8 cm. long, 4.5 cm. diam., yellowish

at base and surrounded by dark brown wool, green above and thinly grey brown woolly with a few irregularly shaped bracts. *Cone* c. 50 cm. long, c. 12 cm. greatest diam., more or less cylindric, tapered gently to base from about $\frac{1}{3}$ up, less so to apex, curved, with c. 21 spirals of

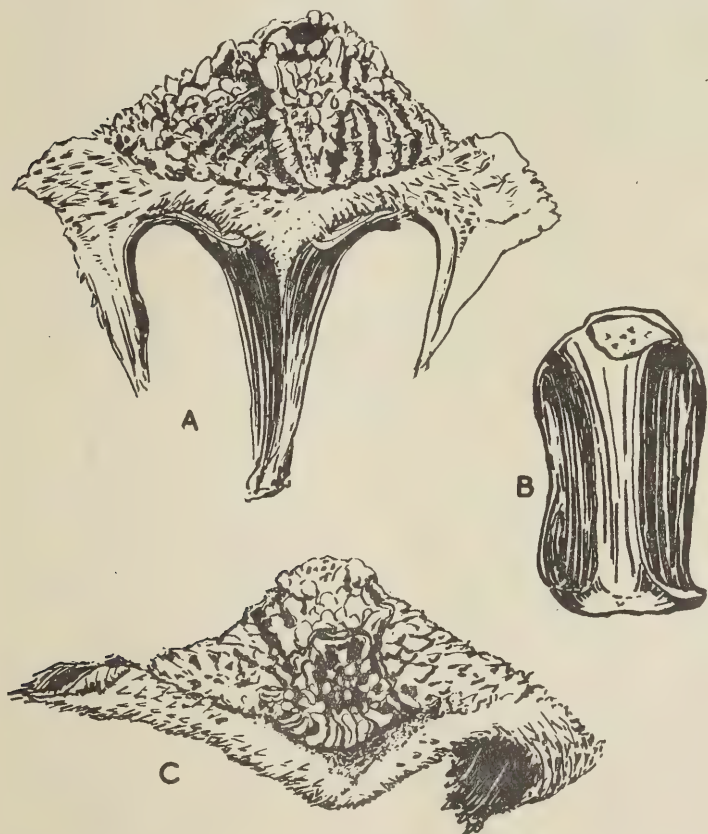


Fig. 10. *E. Altensteinii*. A—median female scale from above, C—from front, B—seed. About nat. size.
Del: M. P. Henderson.

scales, all fertile except a few at apex; *median scales*: body of scale obovate oblong, total length c. 5 cm., width at widest point c. 3 cm., width at base c. 2 cm., length of sporangia bearing surface c. 3.3 cm. edges of scale body irregularly wavy or irregularly minutely toothed,

shoulders (base of beak) with 2 or 3 short teeth on each side; scales progressively narrower towards apex of cone and wider towards base; beak projecting c. 1.7 cm. beyond sporangial surface, slightly decurved in median and basal scales, more so in upper scales, lateral angles acute, upper angle bluntly triangular, lower angle rounded, somewhat ridged; apex of beak flat or slightly concave, lower edge more or less produced and sometimes a little irregular, size variable, usually c. 1 cm. across and 0.5—1 cm. deep; body of scale and upper surface of beak yellowish; apex of beak and lower surface reddish brown with sparse mixed reddish and white scaly hairs. *Female cones* solitary or multiple (usually multiple in Kirstenbosch plants), oblong to oblong-ellipsoid, c. 45—50 cm. tall, c. 22 cm. diam.; general colour yellowish brown, sessile or shortly peduncled; *median scales*: greatest width c. 8—9 cm., c. 3.5—4 cm. vertically; exposed face c. 5 cm. wide and 3—3.5 cm. vertically, protruding c. 2.5 cm.; upper angle rounded with a broad but not conspicuous ridge, lower angle rounded not ridged, lateral angles blunt; upper surface of exposed face glabrous, apex and lower surface brown scaly woolly, the whole surface with blunt irregular rugosities; interior part of scale orange-yellow to scarlet with pointed rugosities; stipe and sinus arms orange-scarlet, the sinus arms with lacerate margins and angles; *seeds* dark scarlet, oblong, angled, blunt, 3.5—4 cm. long, hardly or not tapered to distal end.

As noted above, there is a considerable variation in leaf size and in the size, shape and spininess of the leaflets in this species, and this appears to have led to some confusion with *E. longifolius*. The name "caffer" was at one time commonly misapplied to *longifolius*, and various sources indicate that "caffer" and *Altensteinii* were thought to be so similar that the two species could be gathered from the same individual. The Kirstenbosch plants of *longifolius* are so distinct from *Altensteinii* in general appearance that they can be distinguished at a glance, with their blue-green leaves, rigid in appearance, with markedly recurved apices, and the usually broader leaflets which are lanceolate rather than oblong. However, all the *longifolius* in Kirstenbosch are rather young, none of them having tall stems, and it may be that older plants approach *Altensteinii* more closely. A plant of *longifolius* in the Cape Town Municipal Gardens with a stem about four feet tall retains the characteristic colour, shape and set of leaflets of younger plants, but the leaves are shorter and straighter than usual and not so rigid, perhaps because the plant is in deep shade.

It is to be expected that *Altensteinii* will show variation throughout its considerable geographical range, but any attempt to split the species into smaller units or to describe varieties based on leaf characters are

useless, the possible range of variation in each individual being too great.

(12) *Encephalartos transvenosus* Stapf & Burtt Davy in Burtt Davy, Fl. Transvaal I, 40, 99, fig. 4 B (1926); Hutchinson & Rattray in Fl. Cap. V, ii, 39, sub *E. Altensteinii* Lehm. F. Milner in Journ. Bot. Soc. S.A., xxx (1944). Bot. Mag. t. 7162 appears to be this rather than *E. Altensteinii*.

Nomenclature.—Described originally from leaf specimens. Reduced to *E. Altensteinii* Lehm. by Hutchinson & Rattray, but although closely allied to that species it is sufficiently distinct in foliage and cone characters and habitat.

Distribution.—From Lydenburg District, E. Transvaal, to Zoutpansberg, N. Transvaal.

Specimens seen.—Lydenburg Distr., v. d. Merwe 2306 (Nat. Herb.); Lydenburg Distr., below the Drakensberg, cult. in Johannesburg, Burtt Davy 10959 (Nat. Herb.); Pietersburg, Stanford 22182 (Trans. Mus. Herb.); Modjadjies Mts., cult. at Tzaneen, Burtt Davy 3086, type collection (Nat. Herb., Herb. N.B.G.); Modjadjies Kraal, E. Transvaal, Astley-Maberley s.n. (Herb. Bol., Nat. Herb. 15059); Tzaneen, Rogers 18977 (Trans. Mus. Herb.); Modjadjies location, Pietersburg Div., cult. at Duivels Kloof, Reynolds 4096 (Nat. Herb.); Tzaneen, ex Modjadjies, Rogers 22068 (Nat. Herb.); cult. in Tzaneen, said to be from Modjadjies, Crundall s.n. (Nat. Herb.); Modjadjies location, Crundall s.n. (Nat. Herb.); 15 miles west of Mara station, Zoutpansberg, Reynolds 4107 (Nat. Herb.); Mt. Ararat, Crundall s.n. (Nat. Herb.). Living plants in Kirstenbosch from Duivels Kloof and Modjadjies Kraal.

Description.—From excellent photographs by C. Astley-Maberley in Herb. Bol., Nat. Herb. and Herb. N.B.G. this species reaches a height of at least 24—25 ft., and it is said to grow to 30 ft. or more. The Kirstenbosch plants are all comparatively young, with stems not more than 2—3 ft. The apex of the stem tends to have more brown wool than *Altensteinii* and the leaves resemble those of that species rather closely in general appearance but differ in the broader leaflets more abruptly contracted at base, reduced usually to prickles; the leaflets more spreading throughout the whole length of leaf, the basal ones more or less recurved, the upper ones usually not in a V as in *Altensteinii* and not falcate; leaflets leaving rachis more or less at right angles, not at an upward angle; venation below rather less pronounced, apical spine shorter and more abrupt. *Male cone*: only one dried-up cone has been seen, which is smaller than is usual in *Altensteinii* and with a shorter peduncle; the scale beaks all tend to curve downwards, whereas in

Allensteinii only the apical and basal scales are decurved; the beak in *transvenosus* is wider and less abrupt and less rugose than in *Allensteinii*. Female cones multiple, about the size and shape of those of *Allensteinii* but with smaller scales. A photograph of a female cone labelled as from Tzaneen, coll. P. Koch, is preserved in Nat. Herb. It is very tall, and markedly oblong and narrow, measuring approximately 70 cm. high and 28 cm. diam., with scales about 5 cm. across. Median scales c. 4—4.5 cm. greatest width, c. 3 cm. vertically, exposed face protruding c. 1.5 cm., rugose with pointed rugosities, covered with a rather dense coat of whitish scaly hairs over a yellowish ground, the general colour dirty

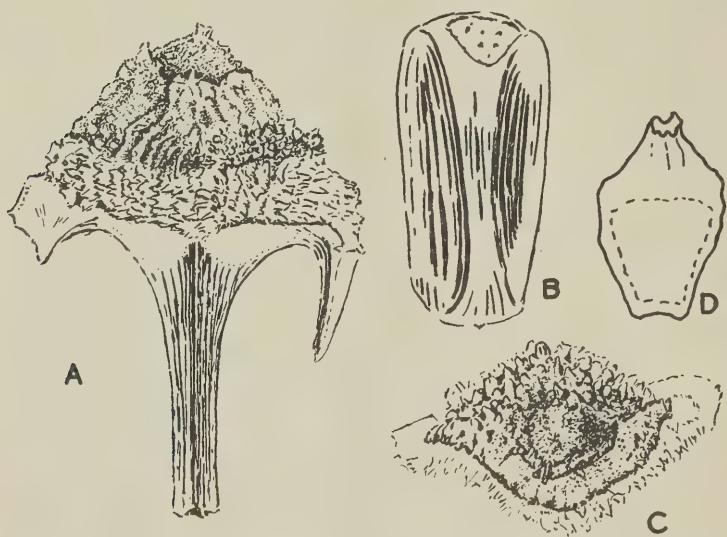


Fig. 11. *E. transvenosus*. A, C—median female scale from above and from side. B—seed. D—median male scale from below. About nat. size.

Del: M. P. Henderson.

greyish-brown; lateral angles bluntly ridged, upper angle rounded or sometimes narrowly ridged, lower angle bluntly rounded; apical umbilicus more or less quadrate, excavate, 1—1.5 cm. diam., lower margin protruding; inner part of scale body yellow with a tinge of orange, deeply rugose with sharply pointed rugosities; stipe pale yellow, c. 3.5 cm. long, tinged pink above where in contact with seed; sinus arms variable, up to c. 2.5 cm. long; seed carmine, c. 4.5 cm. long, 2.3 cm. diam., oblong, roughly triangular in section, hardly tapered to distal end, slightly wedge-shaped.

NOTE.—After the above was written, seeds and scales were received from Miss I. C. Verdoorn from a female cone sent to the National Herbarium by General J. C. Smuts. This came from a plant cultivated at Melmoth which is said to have been obtained originally from the junction of the Black and White Umfolosi Rivers, Zululand. The cone has, I believe, been correctly identified by Miss Verdoorn as that of *E. transvenosus*. If *E. transvenosus* really does occur in this locality, it is the only Transvaal species to be found outside that area, but in view of the fact that the specimen came from a cultivated plant and because of the disparity between the Transvaal and Zululand habitats, it is perhaps better to regard the record as a doubtful one until further collecting can prove or disprove it.

(13) **Encephalartos Woodii** Sander. Hutchinson & Rattray in Fl. Cap. V, ii, 40 (1933); Prain in Kew Bull. (1914) 250, with plate.

Nomenclature.—Originally described by J. M. Wood as a variety *bispinna* of *E. Altensteinii*, but although imperfectly known there is no doubt that it is a distinct species.

Distribution.—Known only from Zululand. Only one or perhaps two clumps of stems have been discovered (the evidence on this point is rather confusing).

Specimens seen.—Cult. in Durban, ex Zululand, *Wylie s.n.* (Herb. Nat. 16044, 16046), *Wood s.n.* (Nat. Herb.); cult. in Durban Museum grounds, *Forbes s.n.* (Nat. Herb.); photograph of two stems at Ngoye Forest, Zululand, by Wylie in Herb. Nat. One plant in Kirstenbosch ex Zululand, *N.B.G.* 1895/16.

Description.—Only the male is known. No female cone has been recorded. Stem tall and very stout, sometimes branched at apex, with dense leafy crown. *Leaves* glabrous, c. 180—190 cm. long, more or less recurved, pulvinus very stout, c. 10 cm. across at base, petiole short and stout, c. 10—12 cm. long; lower *leaflets* more or less ovate, long narrowed to apex, base abruptly narrowed into a short broad petiolule, rather gradually reduced to one or two pairs of prickles, up to c. 20 cm. long, and 5 cm. broad, upper margin of lower leaflets near base usually deeply 3 or more dentate, lower margin occasionally toothed, or lower leaflets more or less entire, upper leaflets narrower, usually more or less entire, but leaflets often dentate and spiny for half length of leaf and uppermost leaflets with short blunt lobes; upper leaflets more crowded than lower, set in a V across the axis of rachis, often hooked and blunt at tips. *Male cone* up to about 120 cm. long on a stout peduncle, narrowly oblong lanceolate, bright orange yellow; *median scales* (dried) narrowly obovate acuminate, total length c. 7 cm., greatest width c. 3.5 cm., beak pro-

jecting c. 2.2—2.5 cm. beyond sporangial surface; sporangia rather small and closely packed; apical flattened part of beak flat or shallowly excavate, rather irregular in shape, c. 1 cm. diam., its lower and sometimes upper margin shortly winged. Uppermost fertile scales long and narrow, c. 5 cm. long, 1 cm. broad, the beak flattened dorso-ventrally, decurved and without flattened apex; scales gradually increasing in size downwards, the apex gradually acquiring a flattened terminal area.

(14) *Encephalartos paucidentatus* Stapf and Burt Davy in Burt

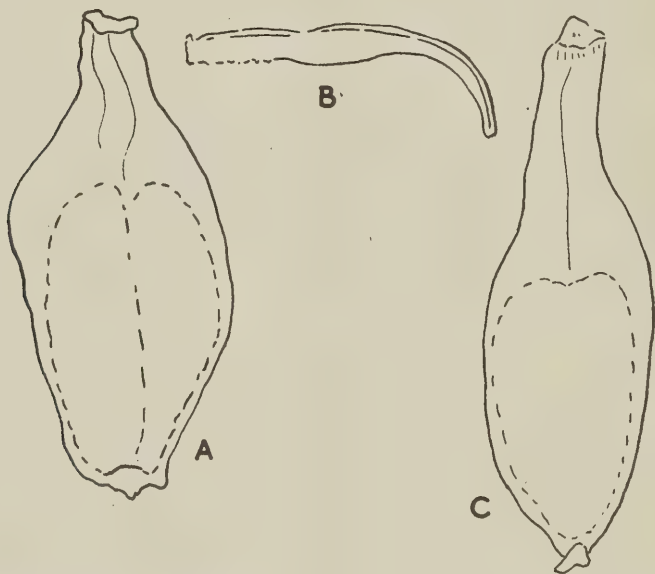


Fig. 12. *E. Woodii*. A—median male scale from below. B—upper scale from side. C—upper median scale from below.

Davy, Fl. Transvaal, I, 40, 99, fig. 4 A (1926); Hutchinson & Rattray in Fl. Cap. V, ii, 40 (1933).

Nomenclature.—No alteration in the status of this species has been suggested. It was originally described from leaf specimens.

Distribution.—Known only from the Zoutpansberg district, N. Transvaal, and from near Barberton, E. Transvaal.

Specimens seen.—Breslau, Limpopo River, Zoutpansberg, Legat 2, type collection (Nat. Herb. 5185); Zoutpansberg, Pöle Evans 5185 (Nat. Herb.); Moodies Estate, Barberton; 4,000—5,000 ft., van Elden

s.n. (Nat. Herb. 10085); Mt. Morgan Creek, Barberton, *Thorncroft s.n.* (Nat. Herb.); Barberton, cult. in Pretoria, *Thorncroft s.n.* (Nat. Herb.); mountains south of Barberton, cult. in Barberton, *Reynolds* 4130 (Nat. Herb.); mountains behind Barberton, cult. in Barberton Town Gardens, *Reynolds* 4128 (Nat. Herb.).

Description.—Unfortunately this is one of the very few S. African species of which Kirstenbosch lacks good material. Plants have very recently been received from Barberton, but it may be some years before they start growth. There is one other plant whose origin is unknown. It agrees with herbarium material of this species, but as it has been grown in good soil in deep shade it has produced larger and more spinose pinnae than plants in a more natural habitat. As no other living material has been seen, the following description of the leaves is drawn up from the Kirstenbosch plant.

Stem apex densely brown woolly. *Leaves* c. 230 cm. long, petiole c. 39 cm., more or less upright, apex recurved, glabrous above pulvinus; upper surface of petiole and lower part of rachis almost flat, lower surface rounded, rest of upper surface of rachis slightly rounded, leaflets arising from a broad, shallow, rather inconspicuous groove; leaflets about 55 pairs rather suddenly reduced at base to lobed prickles and then to a few single prickles, leaflets not overlapping, but more closely spaced in upper quarter of leaf than below, spreading, not in a V, recurved, those in lower half of leaf gradually twisted so that the upper surface near leaflet apex faces upwards; leaflets near base of leaf c. 20.5 cm. long, 3—6 cm. broad, oblong lanceolate, the base broad but suddenly contracted and decurrent on rachis, upper leaflets progressively narrower and shorter, more or less falcate; texture thick; lower leaflet margin with up to 5 narrow short spine-tipped teeth (usually 3), the first two near base of leaflet, the others spaced to about half length of leaflet, upper margin with three similar teeth (usually 1 or 2) spaced in the same way, the teeth becoming shorter and fewer on upper leaflets until they become very short rounded lobes or disappear on the uppermost leaflets; upper surface of leaflets dark green, lower surface paler with close conspicuous ribs, c. 30 in median leaflets.

The type material in Nat. Herb. consists of one sheet, the apical 18 pairs of leaflets of one leaf only, but in spite of the usual variation in size and toothing of leaflets, there is little doubt that the specimens quoted are correctly placed.

No fresh cones of either sex have been seen. The only fertile material available has been two sheets in Nat. Herb., *Reynolds* 4130, 4131, from plants cultivated in Barberton. No complete cones or drawings or photo-

graphs of them have been seen. *Male cone*: Hutchinson and Rattray describe the male cone as $1\frac{1}{2}$ —2 ft. long and 6 ins. diam. *Median scales*: (from *Reynolds* 4130) narrowly oblong ovate to oblong oblanceolate, c. 4—5 cm. long, c. 2—2.5 cm. wide, microsporangia covering body of scale almost to margins, beak projecting c. 0.8 cm. beyond sporangial surface, abruptly decurved, upper and lower angles humped at base, flattened apical part broader than deep, margin more or less irregularly toothed. *Female cone*: The material (*Reynolds* 4131) consists of scales which all appear to have been taken from near the apex of the cone and one seed which seems not to be normal in shape. It is abnormally short, with grooves and excrescences at the micropyle end, a condition which is often seen in other species in the region between the completely infertile apical scales and the normal median scales. The scales of *Reynolds* 4131 are rather narrow, c. 4.5 cm. across, with a very rugose exposed face protruding c. 2.5 cm. The apical umbilicus is rather large, shallowly excavate and much less rugose than rest of exposed face, c. 1—1.5 cm. across, brown hairy. The seeds are said to be red.

(15) *Encephalartos cycadifolius* (Jacq.) Lehm., Pugillus VI, 13 (1834), *emend.* Hutch. and Rattr. in Fl. Cap. V, ii, 42 (1933).

Nomenclature.—According to Hutchinson and Rattray, this species, originally described by Jacquin in 1800 as *Zamia cycadifolia*, was a mixture of two species, a cone, probably that of *E. villosus* being figured. Lehmann apparently accepted Jacquin's figure and description without question and merely made the transfer to *Encephalartos*. At the same time, and perhaps misled by Jacquin's *mixtum compositum*, he described a new species, *E. Friderici-Guilielmi*, which is doubtless the plant we are now discussing. The points he gives to distinguish *E. Friderici-Guilielmi* and *E. cycadifolius* are as follows:—

<i>cycadifolius</i>	<i>Friderici-Guilielmi</i>
1. caudice glabro	1. caudice lanuginoso
2. rhachi semitereti canaliculata pubescente	2. rhachi tetragono lanuginosa
3. pinnis glabriusculis	3. pinnis subtus pilosiusculis
4. fructo glabro	4. fructo dense tomentosa

It is unlikely, in spite of the discrepancies in Lehmann's descriptions, that two species are involved. The Kirstenbosch plants, introduced from Queenstown, Cathcart and Kingwilliamstown, vary very little, and I have seen no herbarium material to suggest that *E. Friderici-Guilielmi* is not synonymous with *E. cycadifolius*. De Candolle, Prodr. XVI, ii, 532, upholds *E. cycadifolius* and reduces *E. Friderici-Guilielmi* to it. It might be suggested that Jacquin's name should be rejected

entirely, on the grounds that it is a "*nomen confusum, dubium, vel ambiguum*", but both in this case and in the case of *E. caffer*, it seems possible to retain the original names without ambiguity, as Hutchinson and Rattray have done.

Distribution.—The species is confined to the Eastern Cape Province. The material seen covers the area round Cradock, Queenstown, Cathcart and Kingwilliamstown. The East London records may be from cultivated plants. Hutchinson and Rattray record it on the authority of Marloth from the Jansenville Division, and they quote a specimen from Uitenhage, collected by Zeyher, preserved in the British Museum Herbarium. Schonland, in Bot. Survey S.Afr. Memoir I, records the species, on the authority of Ecklon, from the Zwartkops River, Uitenhage Div. There is a sheet in the Bolus Herbarium from Kokstad in Griqualand East, collected by the Forest Dept., and Rattray in Fl. Cap. records it from Tsolo, in the southern part of Griqualand East. More collecting is necessary to establish the range of the species.

Specimens seen.—East London Wood 843 (Herb. S.A. Mus.); Kingwilliamstown, *Sim* 1347 (Herb. S.A. Mus.); Queenstown, *Dyer* 2300 (Albany Mus. Herb.); near Queenstown, 4400 ft., *Galpin* 1525 (Albany Mus. Herb., Nat. Herb., Herb. Bol.); Oxtou Manor, Queenstown, seedling only, *Garrick Hay in Herb. Galpin* 8411 (Nat. Herb.); Cathcart, 4000 ft., *Sim* 1361 (Herb. Bol.), *Sim* 2999 (Albany Mus. Herb., Herb. Bol.); 2 miles south of Cathcart on Hogsback road, *Barker* 3431 (Herb. N.B.G.); 5 miles east of Cathcart, *Barker* 3432 (Herb. N.B.G.); Cradock Mts., towards Tarkastad, 1200 m., *Marloth* 2151 (Nat. Herb.); Kokstad, Griqualand East, *Forest Dept. s.n.* (Herb. Bol.); cult. at Union Buildings, Pretoria, ex Cape Province, *Wickens s.n.* (Herb. Natal, 16123); living plants in Kirstenbosch from Queenstown, Kingwilliamstown and Cathcart.

Description.—This species is a distinct one in its stout stem with flat, densely brown woolly apex, its stiff leaves with narrow entire crowded leaflets, and its densely pale woolly cones. In Kirstenbosch it produces cones of both sexes regularly and is one of the few species with male and female cones at the same time. *Leaves* c. 100 cm. long, stiff, rachis more or less straight or slightly recurved and twisted at apex, petiole c. 30 cm. long, but variable, bluntly triangular below, rounded and obscurely bluntly ridged above, underside of rachis and petiole and margins of leaflets loosely whitish woolly in young leaves, older leaves glabrous; young leaves blue green, rachis and leaflet bases yellowish, older leaves yellowish green; *Leaflets* close together, overlapping in upper half of leaf, all in a V, or the lower spreading, arising from narrow grooves in

rachis; median leaflets c. 17 cm. long, 0.7 cm. broad, linear, shortly narrowed to a short pungent point with a short dark brown spine, hardly contracted at base, margins thickened, nerves 7—9, visible on both surfaces. *Male cones* always multiple, often 5 together, peduncle c. 4 cm. long buried in the wool of the stem apex, cone cylindric, tapered to a rounded apex from below middle, shortly tapered to base, curved, c. 28 cm. long, 6—6.5 cm. diam., completely covered by a dense coat of brown wool. This cone does not appear to elongate before shedding pollen as the glabrous or less woolly species do. Cones which are quite dry, with microsporangia all empty, still have a close covering of wool, the wool of one scale matted with the next, so that the only escape for the pollen seems to be through gaps caused by the curving of the cone. A large quantity of pollen is trapped amongst the wool. *Scales* thin, close packed, median ones c. 2.5 cm. long, 2 cm. wide at widest point, sessile, very slightly cordate at base and there c. 1 cm. wide; microsporangia rather large for size of scale and rather few; apical part of scale, when deprived of wool, projecting c. 0.5—0.6 cm. beyond sporangial surface, apex slightly flattened and turned up to a blunt ridge. The woolly covering completely hides this structure and gives the appearance of a flattened apex 1.4 cm. wide and 0.8—0.9 cm. deep. *Female cones* multiple, more or less oblong with rounded apex, 25—30 cm. tall, 15—17 cm. diam.; apices of scales densely covered with brownish wool, the wool of each scale matted with that of its neighbours; apex elliptic-rhomboid, upper and lower angles broadly rounded, lateral angles more or less acute; c. 4.5 cm. across and 2.5 cm. vertically; body of scale below wool pale canary yellow with fine shallow rugosities; stipe c. 2—2.5 cm. long, acutely angled, sinus arms short, broadly triangular, projecting 0.6—0.8 cm. below apex of sinus; sinus c. 1.5 cm. across; *seeds* pale yellow or sometimes pale orange yellow, c. 3 cm. long and 2 cm. diam., flattened dorsally and ventrally, obliquely wedge shaped at distal end. When wool is removed (with difficulty) from scale apex, the surface revealed has slight rugose ridges, a small transversely oblong depression c. 1 cm. $\times$ 0.5 cm., its lower edge somewhat raised and rounded, the lateral angles appearing as slightly raised sharp ridges.

(16) *Encephalartos lanatus* Stapf and Burtt Davy in Burtt Davy, Fl.-Transvaal, I, 40, 99, fig. 4 D (1926); Hutchinson & Rattray in Fl. Cap. V, ii, 43 (1933), in part.

Nomenclature.—Originally described from leaf specimens only. Hutchinson and Rattray reduce *E. laevifolius* Stapf and Burtt Davy to this species, but the two are distinct, both in foliage and cone characters.

Distribution.—Middelburg, Nelspruit, Pilgrims Rest and Belfast Districts of the E. Transvaal.

Specimens seen.—near Middelburg, *Burt Davy* in *Herb. Dept. Agric.* 6645 (Herb. Bol.); Middelburg Distr., *v. d. Merwe* 8041 (Nat. Herb.); Mooi Kopje, Middelburg Distr., *Pole Evans* 1 (Nat. Herb.); Botshabelo, Middelburg Distr., *Verdoorn* 2143, 2144, 2145, 2146 (Nat. Herb., Herb. N.B.G.); Kloofs near Mission Station, Botshabelo, on Little Olifants River, 1500 m., *Marloth* 11748 (Nat. Herb.); Rosehaugh, Sabie, Pilgrims Rest Distr., *Burt Davy* in *Herb. Dept. Agric.* 15239 (Herb. Bol.); rocky slopes opposite Rosehaugh Station, between Nelspruit and Sabie, *Reynolds* 3936 (Nat. Herb.); Amajuba Mt., Schagen, Nelspruit Distr. c. 4000 ft., *Liebenberg* 3351 (Nat. Herb.); Schoemans Kloof, Belfast Distr., *Smuts* 285 (Nat. Herb.); Wilge River, east of Trigaarts Poort, *Dyer and Verdoorn* 4411 (Nat. Herb., Herb. N.B.G.). Said also to occur at Kaapsche Hoop and Godwans River. The Kirstenbosch collection appears to have come from Rosehaugh.

Description.—Stem said to reach 10 ft. Stems of young plants densely pale woolly. Young leaves densely white woolly except on underside of leaflets, the wool soon deciduous and the old leaves glabrous except for woolly base of petiolar pulvinus, up to c. 95 cm. long, petiole c. 20—25 cm. long, apex of leaf abruptly recurved and often twisted sideways; rachis and petiole with a raised blunt triangular rib above, bluntly rounded below; leaflets entire, pungent; close set and overlapping in upper part of leaf, linear, more or less falcate, median ones up to c. 13 cm. long and 0.8 cm. broad, bases yellowish, twisted, and set across rachis so that upper leaflets at least are in a narrow V; nervation visible below, 12—14 nerves in median leaves, more prominent in dried specimens; leaflets very little reduced in size at leaf base. *Female cone* solitary or multiple, oblong, more or less sessile, shortly and bluntly tapered to apex, 34.5 cm. tall, 13 cm. diam. (A photograph of *Verdoorn* 2145 from Botshabelo shows a cone approximately 28 cm. tall and 15 cm. diam. on a peduncle c. 6 cm. long); c. 8—9 spirals of scales; median scales with flattened not protruding rhomboid apex, 4.3—4.9 cm. across, 2.5—2.7 cm. vertically, upper and lower angles rounded, the lower somewhat protruding, lateral angles acute to acuminate, whole face covered with a dense matted coat of short wool, pale brown round edges, whitish grey in centre; centre of face with a shallow ill-defined excavation c. 1.5 cm. diam.; inner part of scale glabrous with a zone of arsenic green just below wool, then brownish and wrinkled; stipe very short and stout, quadrangular in section, c. 1.5 cm. long and 1.5 cm. across at junction with cone axis; sinus arms short, rounded, outer margin acute, sinus c. 1.2 cm. across; seeds oblong orbicular, flattened, more or less wrinkled, c. 2 cm. long, 2.3 cm. diam., the pulp not prolonged beyond

hard inner layer. *Male cone* c. 17.5 cm. long, 5.5 cm. diam., narrowly oblong lanceolate, peduncle c. 11.5 cm., more than half this length buried in apex of stem, c. 2 cm. diam. at apex, and there yellowish brown hairy; 8—9 spirals of scales, all fertile except apical one (a photograph of *Verdoorn* 2146 from Botshabelo shows a cone c. 30 cm. long on a short peduncle); *median scales*: general outline, seen from below, depressed orbicular, c. 2.3 cm. long, c. 3.2 cm. greatest width, apex flattened, rhomboid, c. 2.5 cm. across and 1.4 cm. deep, slightly concave, covered with dense brown short wool, lateral angles acute, narrow, upper and lower angles more or less equal, broad, rounded; body of scale glabrous, green or yellowish green, shading into yellow over sporangial surface.

Kirstenbosch possesses a number of plants which have been placed tentatively with *lanatus*, but which differ slightly in having smaller leaves with smaller less stiff leaflets, occasionally minutely tridentate at apex. Most of these plants are not vigorous and in most the main stem, which is slender, not woolly, and about a foot tall, has died and offshoots have appeared from its base. As far as can be discovered, this group comes from within the area of distribution of typical *lanatus*. The decision as to its status will depend on cones, which have not been seen.

(17) *Encephalartos laevifolius* Stapf & Burtt Davy in Burtt Davy, Fl. Transvaal, I, 40, 99, fig. 4, E, G (1926); Hutchinson & Rattray in Fl. Cap. V, ii, 43 (1933), sub *E. lanatus* Stapf & Burtt Davy.

Nomenclature.—Stapf and Burtt Davy described this species more fully than usual, including descriptions of the male and female cones, but figuring only very poorly the leaflets. Hutchinson and Rattray reduce it to *E. lanatus*, but the two species are distinct in foliage and cone characters. I believe that the descriptions of the cones of *lanatus* given in Fl. Cap. apply correctly to that species, although that of the female cone is rather difficult to follow. If Hutchinson and Rattray had dried scales of *lanatus* before them it is hard to see how they reconciled them with the descriptions of those of *laevifolius* in Fl. Transvaal.

Distribution.—Apparently confined to a rather small area in the Barberton and Nelspruit Districts of the E. Transvaal, overlapping with the distribution of *lanatus* but more to the east than that species.

Specimens seen.—Moodies, near Barberton, *Todd* 2043, ? type collection (Nat. Herb.); Godwans River, 3,000—4,000 ft., Barberton Distr., *Thornicroft in Herb. Rogers* 28427 (Trans. Mus. Herb., Herb. Bol., Herb. S.A. Mus.); Munnik-Myburgh mine, near Kaapsche Hoop, Barberton Distr., *Unkles s.n.* (Nat. Herb.); near Berlin Forestry Station, Barberton, *van Nouhuys s.n.* (Nat. Herb. 10086); mountains near Alpine Mine, 12 miles S.W. of Barberton, cult. in Town Gardens, Barberton, *Reynolds*

4122, 4124, 4125, 4127 (Nat. Herb.); Elandshoek, Barberton Distr., cult. in Hort. H. B. Christian, *Christian* 583 (Nat. Herb., Herb. N.B.G.); Amajuba Mts., Schagen, c. 4,000 ft., Nelspruit Distr., *Liebenberg* 3342 (Nat. Herb.); Farm Cromdale, 4 miles from Nelspruit on road to Barberton, cult. in Hort. W. Unkles, photographs and drawings of male cone and plant in Nat. Herb.; cult. in Garden of Division of Botany, Pretoria, origin not stated (Nat. Herb.); living plants in Kirstenbosch

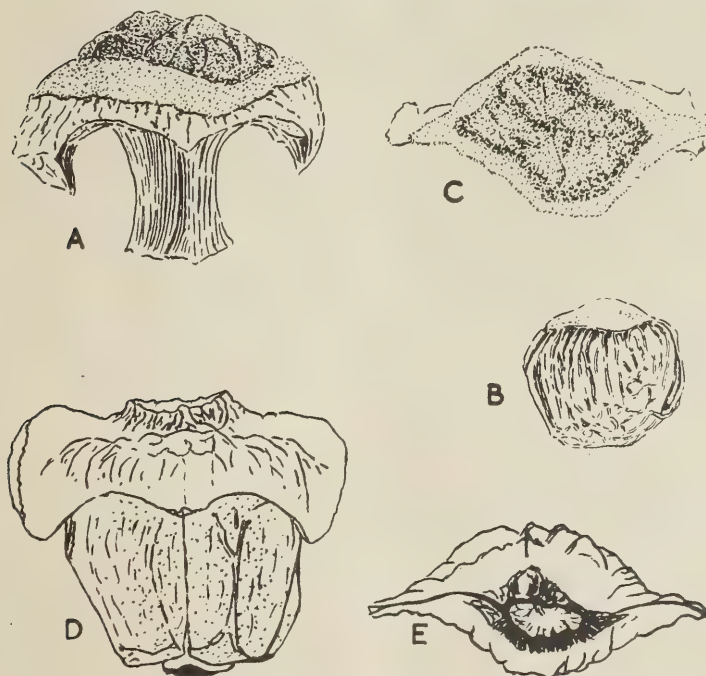


Fig. 13. A, C—*E. lanatus*, median female scale from above and from front, B—seed.
D, E—*E. laevifolius*, median female scale and seeds from above and from front.
About nat. size. Del: M. P. Henderson and L. van Niekerk.

introduced from Malelane and Elandshoek, E. Transvaal. I have not seen *Davy* 32d and Sim's plant from Rosehaugh mentioned by Burt Davy in Fl. Transvaal.

Description.—Stem rather slender, said to reach c. 10 ft. Young leaves densely pale brown woolly all over except lower surface of leaflets,

the wool soon deciduous and the leaves then glabrous and blue green with pale rachis and petiole, the old leaves yellowish green with brownish rachis and petiole; mature leaves up to c. 100 cm. long, petiole up to c. 25 cm.; petiole and rachis with raised keel above, rounded triangular below, leaves nearly straight, usually with a sideways or spiral twist at apex; *leaflets* linear, up to 12 cm. long and 0.6 cm. broad, shortly pungent, bases yellowish, slightly contracted, lower leaflets reduced in size, sometimes almost to prickles, spreading in lower part of leaf, the upper ones in a wide or narrow V, or curved inwards, entire, or occasionally the uppermost with a minute tooth on either margin near the tip; nervation below fine but quite visible, c. 10 nerves in median leaflets. The leaves differ from those of *lanatus* chiefly in being generally longer and straighter, the leaflets more spreading and not so stiff and pungent. *Male cones* multiple (three together in Kirstenbosch plant), narrowly cylindrical, curved, tapered gently to apex and base from below the middle, c. 38 cm. long, 10 cm. greatest diam., peduncle 3–4 cm. long, hidden by bracts so that cone appears sessile, minutely white pubescent; c. 24 spirals of scales, only a few at apex and base infertile; general colour greyish green; *median scales* c. 3.5–4 cm. long, c. 3.4–3.5 cm. greatest width, very shortly stalked and slightly cordate at base, upper surface of scale body flat or slightly channelled, yellowish, sporangial surface flat or slightly raised in centre; beak projecting c. 1 cm. beyond sporangial surface, upper angle rounded and more or less humped, lower angle rounded, lateral angles acute, not winged or toothed, flattened apex of beak shallowly excavate, the lower margin slightly more prominent than upper; beak covered with dense greyish felted tomentum, decreasing towards base of beak and allowing the green ground colour to show through. *Female cones* multiple (in Kirstenbosch plant), when young the scales greenish with broad rhomboid flat not sunken apices, covered with dense short pale brown wool, nearly glabrous when mature oblong, c. 20 cm. tall and 10 cm. diam., with c. 10 spirals of scales, peduncle 4–5 cm. long; *median scales* c. 4 cm. long, c. 4.5 cm. greatest width, c. 2 cm. vertically, stipe stout, c. 2 cm. long, lateral angles sharply winged, and running up as wings to apical umbilicus, upper and lower angles rounded, the exposed face somewhat depressed, so that the upper angle becomes a thickened ridge; apical umbilicus with protruding margins, deeply excavate, irregularly rhomboid or triangular, c. 1 cm. broad and 0.5 cm. vertically; the whole of exposed face more or less smooth, glabrous except for apical crater and its margins which are thickly covered with whitish scaly hairs which become brown in drying; rest of scale glaucous over brown ground colour; sinus arms short and rounded, the outer margin acute to winged; *seeds* brown with raised

blackish dots, oblong obovate, distal end truncate, angled, c. 2.5 cm long and 1.7 cm. greatest diam.

(18) *Encephalartos Ghellinckii* Lem. Hutchinson & Rattray in Fl. Cap. V, ii, 43 (1933).

Distribution.—Mainly in Natal, but coming as far south as Tabankulu in Pondoland; and from near the Natal coast to the eastern slopes of the Drakensberg.

Specimens seen.—Port Natal, *Sanderson* 119 (Albany Mus. Herb., Nat. Herb.); Umzinto Distr., Natal, cult. in Botanic Gardens Durban, *Wood* 11864 (Herb. Natal.); Tugela Falls, Drakensberg, cult. in Botanic Gardens, Durban, *Wood* 11865, *Putterhill* in Herb. Natal. 12446 (Herb. Natal.); Mont aux Sources, Natal, *Hutchinson, Forbes & Verdoorn* 58 (Herb. Natal., Nat. Herb.); Giants Castle, Natal, *Symons* 498 (Trans. Mus. Herb.); Devils Hoek, National Park, Natal, *Galpin* 9648 (Nat. Herb.); Cathedral Peak Hotel, Natal, *van der Riet s.n.* (Nat. Herb.); Mont aux Sources, cult. at Pretoria, *Doidge s.n.* (Nat. Herb.); Drakensbergen, c. 700 ft. from summit, *Mogg s.n.* (photo. in Nat. Herb.); Flagstaff, Pondoland, *McLoughlin* 513a (Nat. Herb.); plants in Kirstenbosch from Tabankulu, Pondoland, *N.B.G.* 160/15, 2774/15.

Description.—Stems several feet tall, often leaning. *Leaves* at first erect, appearing feathery, up to c. 100 cm. long, petiole up to c. 25 cm. long, pulvinus small, densely covered with silky brown wool, petiole and rachis with broad rounded triangular ridge above, the petiole below with an obscure ridge, rachis below nearly flat; in young leaves the petiole, rachis and leaflets covered with a dense cobwebby greyish white tomentum, older leaves glabrous; rachis nearly straight, often slightly incurved, often more or less spirally twisted near apex of leaf, yellowish after losing tomentum; *leaflets* dark green with paler apices, c. 130 pairs, widespreading, often somewhat recurved and usually upcurved, lower ones rather distant and only slightly reduced in size, upper ones closer but not overlapping, subacicular, often uniform in length throughout most of leaf, or the median ones longest, up to c. 12 cm. long and 0.2–0.4 cm. broad, apex abruptly pungent pointed, margins strongly revolute, nerves obscure on both surfaces in life. No fresh *male cones* have been seen. When dry they are c. 25 cm. long, 6–7 cm. diam. on a peduncle 3–4 cm. long, decurved, cylindric, tapered slightly to both ends, densely covered with a matted coat of brownish wool, scales with flattened, more or less rhomboid tops, not beaked; *median scales* thin, broadly obcordate, stalked, c. 3 cm. greatest width, c. 2.5 cm. long, c. 1.5 cm. broad at base, stalk up to c. 1.5 cm. long, more or less peltately attached; rhomboid scale apex c. 2 cm. across and 1 cm. deep measured

over woolly covering, lateral angles thin and winged, body of scale with thin, rather wide, nude margin; scale apices when deprived of wool with a shallow irregularly rhomboid excavation c. 0.7 cm. across and 0.3 cm. vertically, the upper and lower angles rounded and slightly humped. No living *female cones* have been seen. A photograph in Nat. Herb. taken by A. O. D. Mogg on the Drakensbergen shows a plant with 5 cones, more or less oblong ellipsoid, very densely woolly and resembling those of *E. cycadifolius*. Dried scales and a coloured drawing in Nat. Herb. show the scales to have a flattened more or less rhomboid apex densely covered with brownish wool, the stipe very stout, golden yellowish, sinus arms very short, seeds golden yellow, broadly oblong.

A very distinct species with its feathery leaves with subacicular leaflets, very woolly cones and stalked male scales.

(19) *Encephalartos* sp. aff. *E. Ghellinckii* Lem.

A single plant in Kirstenbosch whose origin and other particulars are unknown, *Henderson* 1566 (Herb. N.B.G.).

Description.—Aerial stem c. 10 cm. tall, c. 13–14 cm. diam. at ground level. *Leaves* up to c. 40 cm. long, erect, rather stiff, spirally twisted near apex, young leaves rather densely pale woolly on rachis, the leaflets less densely woolly on both surfaces, older leaves glabrous, pulvinus almost glabrous; petiole up to c. 10 cm. long, yellow green like the rachis; *leaflets* narrowly linear, acute, close but not overlapping, spreading, often reduced at base but not to prickles, median ones longest, up to c. 11 cm. long and 0.4–0.5 cm. broad, dark green above, paler below, usually more or less upcurved, base yellowish, not contracted, apex pungent with a short pale yellow spine, margin very slightly revolute or not more than thickened, nerves about 5, visible above and below in life, obscure above and prominent below when leaf is dry. No cones have been seen.

No other material than the one plant in Kirstenbosch has been seen, but there is reason to believe that the plant occurs at Zwarttruggens, W. Transvaal, although up to the present no confirmation of this has been possible. A search of the Gardens records does not reveal that any *Encephalartos* was introduced to Kirstenbosch from this area, but it may quite easily have been sent from another garden.

This plant appears to be allied to *Ghellinckii*, differing in the smaller leaves and the broader and flat or almost flat leaflets. *Ghellinckii* occasionally has leaflets with the margins much less revolute than usual.

If it is really a Western Transvaal plant then it is probably an undescribed species, and the Transvaal counterpart of *Ghellinckii*. Until its locality has been proved, and cones collected, no more can be said about it.

(20) **Encephalartos sp.** "West's Cycad."

A group of plants from Zululand, Swaziland and Paulpietersburg, North Natal, which has been given the temporary name of "West's Cycad"; and a single male plant in Kirstenbosch which has lost its label, but which is thought to have been sent by D. R. Keith from Swaziland in 1935 (*Henderson* 1607 in Herb. N.B.G.).

The Paulpietersburg plant has only recently been discovered, and it bears a female cone of which I have seen scales and seeds, as well as a photograph and a drawing and notes by Miss I. C. Verdoorn. It is distinct from that of any other South African species and there can now be little doubt that "West's Cycad" is an undescribed species, if all the specimens enumerated below are correctly placed in the same group. If the Kirstenbosch plant also belongs, it reinforces this conclusion, for its male cone is distinctive. But the matching of these specimens has been done on foliage characters alone, which are notoriously difficult in the herbarium, and there has been no opportunity to see and compare numbers of living plants from each locality. The description is compiled from all material available, in the belief that only one species is represented, but until cones of both sexes from all localities are examined, there is an element of doubt.

Specimens seen.—Common on rocky summit of Lebombo Mts., near Ingwavuma, Zululand, *West* 2118 (Herb. Natal., Nat. Herb.); Ingwavuma, Zululand, *Conyngham A, B, C* (Nat. Herb.); near Ravelston, Stegi, Swaziland, *Keith s.n.* (Nat. Herb., Christian 597 in Herb. N.B.G.); Stegi, Swaziland, *Keith s.n.* (Nat. Herb.); Paulpietersburg, Natal, *Schoeman* 1 (Nat. Herb.).

Description.—Stem rather stout, up to 6 ft., fide M. Schoeman, with domed top, more or less woolly, bracts rather small, deciduously woolly; leaves close set, yellowish green, straight or slightly recurved at apex, reaching c. 135 cm. or more in wild plants, pulvinus rather stout, brown woolly at base, collar dirty white, almost hidden by bracts; petiole variable in length, usually short, c. 6—8 cm. long, upper surface with obscure blunt ridge which disappears less than half way up rachis, which then becomes rounded, lower surface of petiole and rachis rounded; leaflets c. 50—75 pairs, green not glaucous, median ones linear lanceolate or linear oblong, c. 11.5 cm. long and 1.5—1.6 cm. broad (up to 16 cm. x 2 cm. in wild plants), slightly falcate, more or less spaced and not overlapping in lower third of leaf, more crowded and tending to overlap above, base of leaflet shortly contracted, yellowish, apex abruptly pungent, sometimes slightly hooked, both margins with 2, 1, or 0 short spine-tipped teeth 0.5—0.6 cm. long near base of leaf, shorter in upper

leaflets, lower margin more frequently toothed than upper, upper leaflets often entire, or teeth reduced to small blunt excrescences; basal leaflets reduced in size, finally to prickles, more or less spreading, upper ones in a wide V; nerves below slender but easily visible, c. 25 in median leaflets. *Male cone* solitary, general colour dull orange yellow, peduncle 4—5 cm. long, tapering, completely hidden by tough narrow lanceolate bracts densely covered with deciduous brown wool, length (excluding



Fig. 14. *Encephalartos* sp. "West's Cycad". A, B—female scale from above and from front, C—seed, D, E—median male scale from below and from front. About nat. size.

Del: M. P. Henderson.

peduncle) 34 cm., greatest diam. c. 10 cm., about 1/3rd from base, tapering very gently to apex, more abruptly to base, cylindric, c. 14 spirals of scales; *median scales* c. 3 cm. long, c. 3.5 cm. greatest width, almost orbicular in outline, free part projecting c. 1 cm. beyond sporangial surface, lateral angles slightly winged and irregularly toothed, continued over exposed face as a sharp decurved ridge so that the scales

appear to overlap downwards; upper angle humped, this becoming more pronounced towards base of cone so that a flattened vertical area appears on exposed surface of scale. This cone differs strikingly from the normal type in the stiffness and closeness of the scales after elongation, the small crowded microsporangia, and the absence of a beak. The downward overlapping scales are quite different from those species in which there is no beak, but in which the scale apex is flattened and rhomboid. *Female cone* more or less oblong or ovate oblong, narrowed rather abruptly to apex on account of 4—5 spirals of reduced scales; 11—12 spirals of scales in all; c. 30 cm. tall, c. 17 cm. diam.; *median scales* c. 6 cm. long, exposed face, c. 5 cm. across and 3 cm. vertically, more or less rhomboid, flat, hardly protruding, antimony yellow to clay coloured (fide Miss Verdoorn), upper angle rounded, lower angle rounded, truncate, or sometimes subacute, slightly projecting downwards, sometimes with two parallel obscure ridges, lateral angles subacute, with a narrow roughly toothed crest running more or less horizontally to central umbilicus, and then along its lower rim; umbilicus rather obscure, apparently often partially obliterated by papillate excrescences, narrowly oblong, more or less excavate, coarsely pale brown hairy, the hairs sometimes extending to lower half of exposed face; upper half of face more or less corrugate, and papillate towards centre; inner parts of scale stipe and sinus arms scarlet, body closely and irregularly lacerate-papillate, stipe smooth, sinus arms with outer margin more or less winged and lacerate; *seeds* red, oblong, somewhat tapered to distal end, c. 4 cm. long and 2 cm. diam., very fleshy, hilum rather small.

(21) **Encephalartos sp.**

Henderson 1591, 2144, 2145 (Herb. N.B.G.).

There are four plants of this group in Kirstenbosch, two of them males, the other two rather larger, but their sex unknown. The origin of these plants is quite unknown. No herbarium material from wild plants has been seen which matches them, and except for a sheet in the Bolus Herbarium prepared from one of them, no dried material referable to the group has been seen. If they are of S. African origin, which is highly probable, they appear to be undescribed. The leaves look a little like those of *Altensteinii* and there is a resemblance also to this species in the male cone scales, but the general appearance of the plants is not that of *Altensteinii* and there are differences in detail.

Description.—Stem very stout, ovoid, short (60—90 cm.), pale coloured with large scales, apex with some brown wool, leaf rows very widely spaced (perhaps a consequence of comparatively rapid growth in good soil); *leaves* not glaucous when young, rather straight, or rachis slightly and gently recurved at apex, up to c. 155 cm. long, pulvinus

very stout, c. 8—10 cm. across at base, with a conspicuous pale brownish white collar with narrow reddish brown margin, petiole usually short, reaching c. 30 cm.; leaflets 45—50 pairs, basal ones more or less spreading but not reflexed, upper in a wide V; lower more or less spaced, upper overlapping; gradually reduced in size at base to very small bifid leaflets and occasionally to prickles; *median leaflets* c. 15 cm. long, 2.5 cm. wide, oblong lanceolate, gently narrowed at base and there pale green, apex with a pale yellow spine tipped brownish c. 5 mm. long; lower margin of leaflet often with 1—3 short triangular spine-tipped lobes usually not more than c. 1.5 cm. long, except where they occur near leaflet tip, where they are usually deeper and broader; upper margin of leaflet generally entire, but sometimes with one spine-tipped tooth; lobes usually not much twisted out of plane of leaflet; upper surface of leaflet shining deep green, lower surface paler, not shining, the venation slender but distinct, c. 20—25 nerves in median leaflets. *Male cone* solitary or multiple, peduncle stout, c. 4 cm. long, 3.5 cm. diam., green, thinly pale woolly with a few scattered scale bracts; general colour of cone pale yellowish, c. 33 cm. tall, 10—11 cm. greatest diam., more or less cylindric, tapered gradually to apex and slightly to base from a little below middle; 15—16 spirals of scales; *median scales* oblong obovate, total length c. 4 cm., greatest width c. 2.5 cm., beak projecting beyond sporangial surface c. 1—1.2 cm., slightly decurved, sides rugose, lateral angles blunt to subacute, irregularly toothed, upper angle humped, triangular acute, lower angle similar; flattened apex of beak irregularly quadrangular, slightly excavate, lower margin more or less irregularly and inconspicuously toothed. *Female cones* not seen.

(22) **Encephalartos** sp.

A single small plant in Kirstenbosch, origin unknown, *Henderson* 2032 (Herb. N.B.G.).

A female cone, and leaf specimens which match *Henderson* 2032 have been received from Miss H. M. L. Forbes, gathered from plants cultivated in the Durban Botanic Gardens. The origin of these plants is unknown, and it may be that neither they nor the Kirstenbosch plant are South African. As, however, attempts to identify the group with extra-regional species have failed, the description which follows has been included. If these plants are South African in origin, it appears that they represent an undescribed species.

Description.—(The description of the leaves is drawn up from both the Kirstenbosch plant and an almost fresh leaf specimen from Durban.) Stem (Kirstenbosch plant) slender, only the apex above ground, with broad brownish scales; *leaves* up to c. 135 cm. long, rather stiff and erect, rachis almost straight, petiole c. 3 cm. long, young leaves with sparse white tomentum on rachis near base, older leaves glabrous except for

some brown wool round petiolar pulvinus ; *leaflets* spreading or in a wide V in lower half of leaf, spaced in lower half, closer above but hardly overlapping, median and mid-upper ones longest, oblong lanceolate or more or less linear oblong, up to c. 18 cm. long and 1.8—2 cm. broad, bases slightly paler than rest of leaflet, rather abruptly and shortly

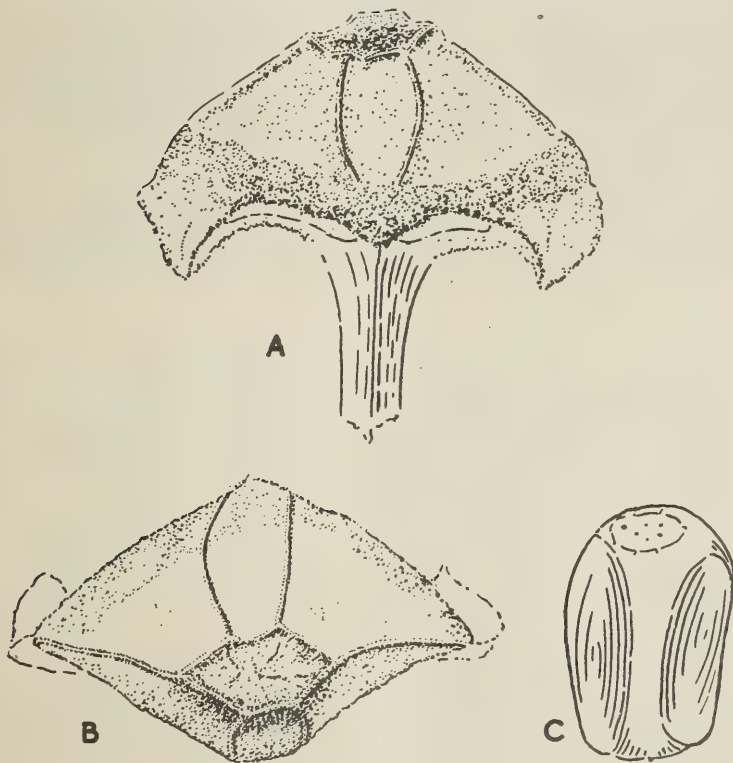


Fig. 15. *Encephalartos* sp., female cone scales from a plant of unknown origin cultivated in Durban. A—median scale from above, B—from front, C—seed. About nat. size. Del: M. P. Henderson.

contracted on upper margin, lower margin slightly contracted and decurrent, both margins with 3—6 short, narrow, spine-tipped teeth, more or less equally spaced along the margins, or two or three closer together near base of upper margin, the teeth near apex deeper and giving the effect of a bi- or tri-dentate apex, basal leaflets gradually reduced in size to prickles, which reach nearly to pulvinus ; venation below fine, c. 18—

20 nerves in median leaflets. *Female cone* oblong, truncate at base, narrowed slightly to apex, c. 42—44 cm. tall, c. 18 cm. diam.; peduncle very stout, c. 7.5 cm. diam. near its apex, green, glabrous; c. 12 spirals of scales, a few reduced infertile ones at cone base; general colour of cone green; axis stout, c. 8 cm. diam. at base. *Median scales*: total length c. 5.5—6 cm., greatest width c. 6 cm., greatest depth vertically c. 3 cm., exposed face roughly hexagonal, protruding c. 1.5 cm., smooth or lightly corrugate, glabrous, shading from dull grey green or sage green at apex to yellowish green at base of exposed face; lateral angles as short acute ridges running in a downward curve to apex, upper angle broadly rounded with two raised lines c. 1 cm. apart running from apex and converging at base of exposed face, lower angle rounded, humped, and more or less protruding, with two similar parallel lines converging below, these lines forming the boundaries of the narrow upper and lower facets of the hexagonal exposed face; apical umbilicus rather large, roughly hexagonal, more or less excavate, smooth, glabrous, c. 2 cm. across and 1—1.5 cm. vertically, placed below centre of exposed face so that the scale appears somewhat bent downwards, lower margin of apical umbilicus protruding; base of exposed face finely punctate, the inner part of scale body with short blunt irregular papillae; sinus arms and stipe salmon pink, sinus arms very short, sinus c. 2 cm. wide, stipe angled, c. 2.5—2.8 cm. long; *seeds* c. 3.6 cm. long and 2.5 cm. diam., dull scarlet with faint whitish bloom, oblong, slightly tapered to micropyle end, 4-angled.

In outline the scales resemble those of *villosus* a little, but the protruding face with hollowed apex is quite distinct from that species.

Encephalartos tridentatus (Willd.) Lehm., Pugillus VI, (1834).

This plant was first described as *Zamia tridentata* by Willdenow, who gave the locality as “? Cape of Good Hope.” It was figured in Miq., Monogr. Cycad. t. 6, a tracing of which has been supplied by Miss I. C. Verdoorn. Index Kewensis gives it as S. African but Hutchinson and Rattray do not mention it. Lehmann’s description is as follows: “*E. caudice . . . , rhachi semitereti canaliculata pinnisque linearibus subsulcatis apice irregulariter inciso-tridentatis glabris.*”

Miquel’s figure is of a single apparently almost complete leaf with a very long slender petiole more than two-thirds the length of the rest of the leaf. The leaflets are very narrow, linear oblong, the median ones about 20 times as long as broad, the nervation apparently evident, sometimes with a short tooth a little above the middle and one near apex, the apex bidentate or tridentate, like *E. villosus*; rachis slender, leaflets spaced, not reduced at base, no prickles on petiole.

I have not been able to place this plant. It may be a juvenile or seedling leaf of one of the known species.



PLATE II.

1. *E. caffer*, male cone.

2. *E. caffer*, female cone.

3. *E. villosus*, male cones.

4. *E. villosus*, female cone.

[Photo : M. R. Henderson,



PLATE III.

1. *E. latifrons*.

2. *E. sp. aff. latifrons*, Henderson 1680.

3. *E. sp. aff. latifrons*, Henderson 2017.

4. *E. sp. aff. latifrons*, Henderson 1562.

[Photo : M. R. Henderson.]

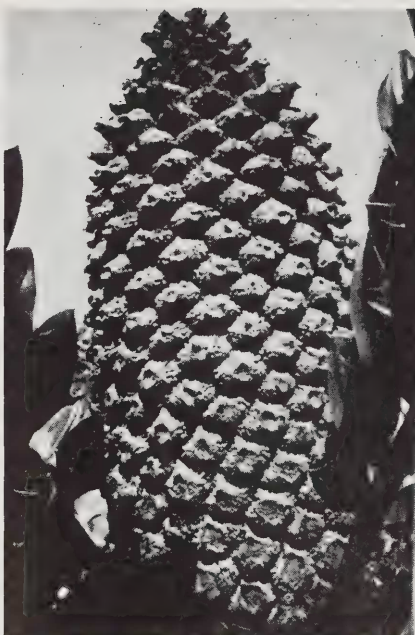


PLATE IV.

1. *E. horridus*, female cone.
3. *E. horridus*, male cone.

2. *E. latifrons*, female cone.
4. *E. latifrons*, male cone.

[Photo : M. R. Henderson.]

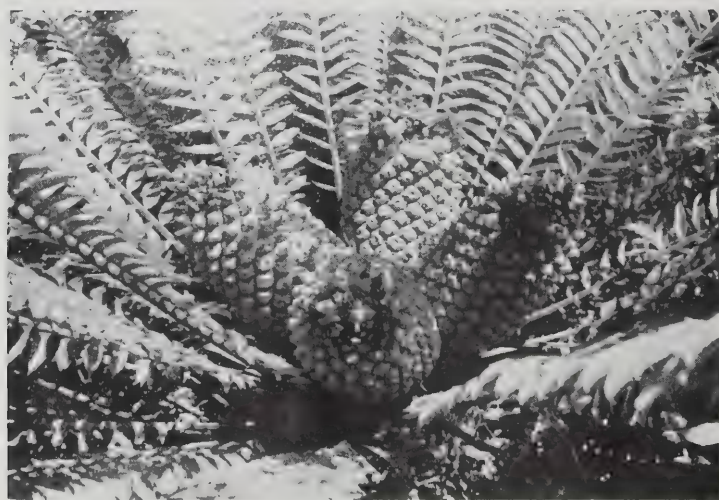


PLATE V.

1. *E. kosiensis*, male cone.

2. *E. transvenosus*, female cones.

[Photo : M. R. Henderson.]

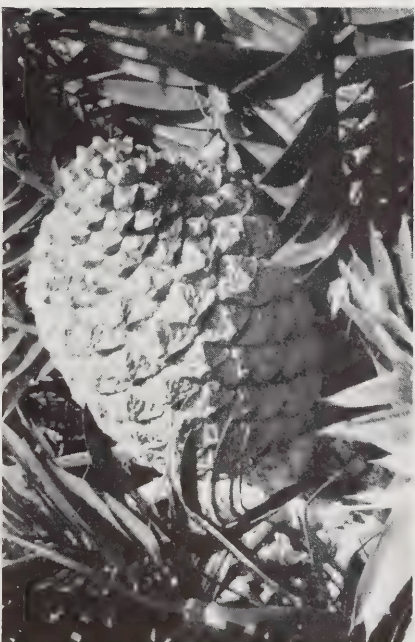
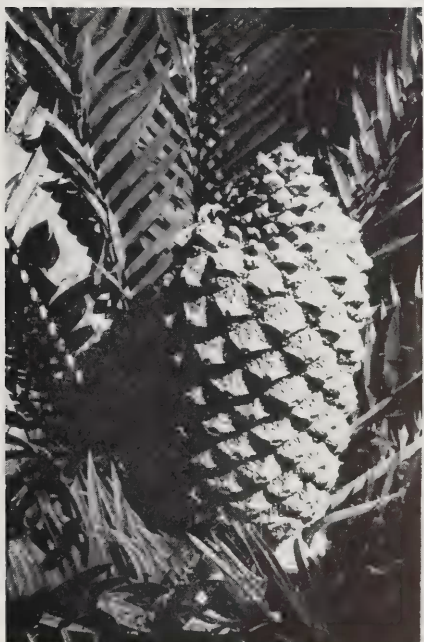
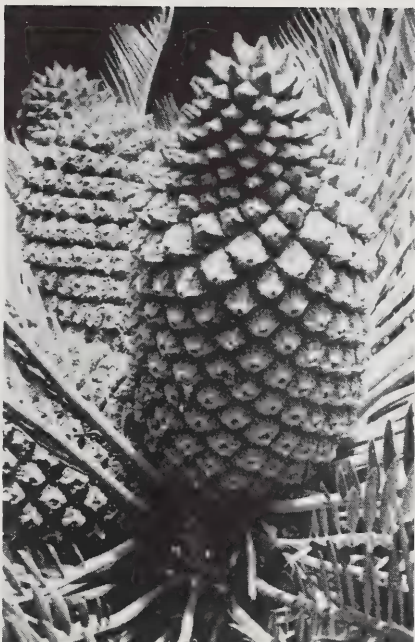


PLATE VI. *E. Lehmannii*.

1. Female cone, form "A".
3. Female cone, form "B1".

2. Female cones, form "D".
4. Female cone, form "B2".

[Photo: M. R. Henderson.]



PLATE VII. *E. Lehmannii*.

1. From left to right : one leaf of form " A ", two leaves of form " C ".
2. From left to right : One leaf of form " B2 ", two leaves of form " B1 ".
3. Plant of form " F ".
4. From left to right : Two leaves of form " B ", male plant, two leaves of form " F ".

[Photo : M. R. Henderson.

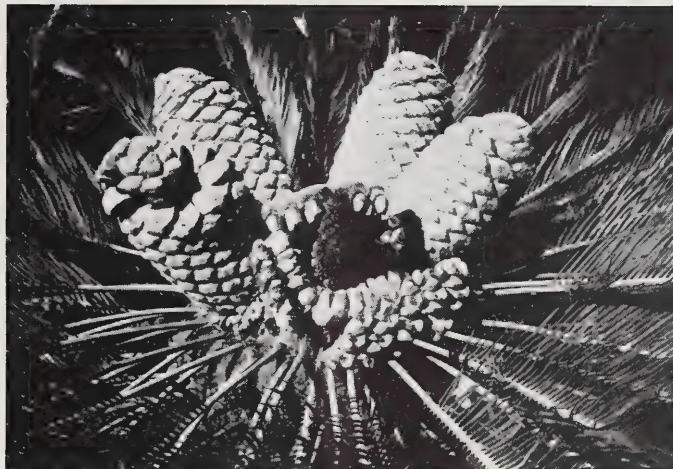


PLATE VIII, *E. cycadifolius*.

1. Female cones.

2. Male cones.

{Photo : M. R. Henderson and F. W. Thorns.

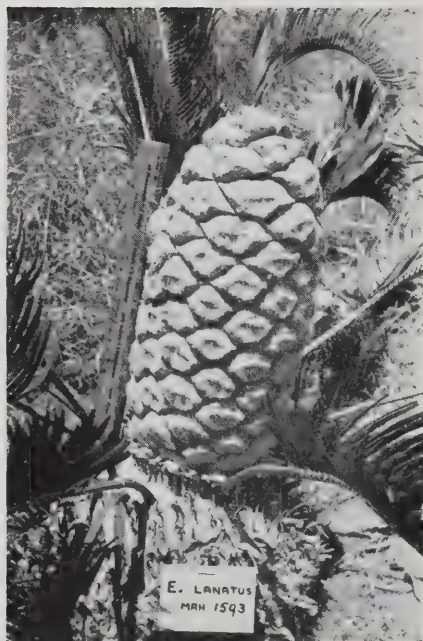


PLATE IX.

1. *E. laevifolius*, female cones.
3. *E. laevifolius*, male cone.

2. *E. lanatus*, female cone.
4. *E. lanatus*, male cone.

[Photo : M. R. Henderson.]



PLATE X.

1. *E. Ghellinckii*, with old male cone.
2. *Encephalartos* sp., of unknown origin, Henderson 2032.
3. *E. sp.*, aff. *Ghellinckii*, Henderson 1566.
4. Female cone of unknown origin, cult. in Durban, probably the same species as Henderson 2032.

[Photo : M. R. Henderson.]